



Service Manual

AX-201

Software release - 2.0

PHILIPS

Assembleon
Integrated electronics manufacturing solutions

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Service Manual

A.SYSTEM

B.BASE

C.BOARD TRANSPORT

D.PICK AND PLACE

E.FEEDER TROLLEY (4022 593 51233 07.03)

F.VISION

G.XY-ROBOT

H.TRAY TROLLEY (4022 593 51241 07.01)

I.FLUXER

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A. SYSTEM

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CHAPTER A1 Introduction

A1.1 General

This machine has been designed for fast and accurate placement of components on printed circuit boards. Because of its modular built-up, it can be configured to the customer's desires in a flexible way.

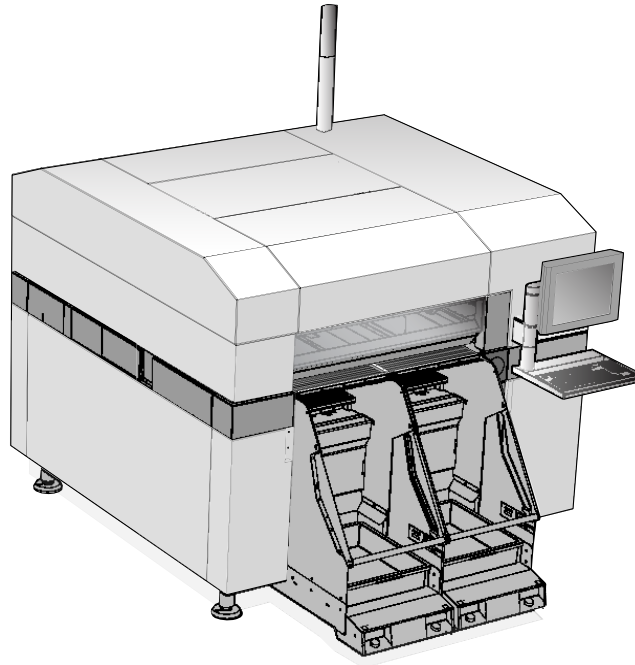


Figure 1 AX-201

A1.2 Purpose of this service manual

The purpose of the Service Manual is to supply sufficient information to keep this machine in such a condition that a performance within specification is guaranteed.

A1.2.1 Target groups

The target groups for this manual are:

- authorized maintenance personal
- customer service field engineers
- Assembléon training centres.



NOTE: Concerned people are expected to be well informed about the content of the AX-201 operating manual.



NOTE: All screws and bolts on this machine, locked with sealing/locking paint, may NOT be loosened, unless explicitly stated.

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A1.3 Conversions

Physical quantity	SI symbol	Conversion factors
Length	m	1 mm = 0.004 inch 1 m = 39.37 inches 1 inch = 25.4 mm
Volume	m ³	1 imp. gall. = 4.55 l 1 US gall. = 3.79 l
Air flow		1 NI = 1 l at 0 °C and 1 atm.
Mass	kg	1 kg = 2.2 lb 1 lb = 455 g 1 oz = 28.35 g
Force	N	1N = 1 kgm/s ²
Pressure	Pa (N/m ²)	1 atm. = 1013.25 mbar 1 Torr = 1.33322 x 10 ² Pa 1 mbar = 100 Pa 1 PSI = 6900 Pa
Work/energy	J (Nm, Ws)	1 J = 10 ⁷ ergs 1 cal. = 4.1868 J
Power	W (J/s)	1 HP = 735.5 W
Temperature		°C = 5/9(°F-32) °F = (9/5x°C)+32

Figure 2 Conversion table

A1.4 Outline of this service manual

The service manual consists of one **system** part and seven parts:

- a) System (this part, [A. SYSTEM](#))
Contains the built up/configuration of the system, general machine descriptions, machine/process principles and descriptions of the system architecture.
- b) Base, see [B. BASE](#)
- c) Board transport, see [C. BOARD TRANSPORT](#)
- d) Placement heads, see [D. PICK AND PLACE](#)
- e) Feeder trolley, see [E. FEEDER TROLLEY](#)
- f) Vision, see [F. VISION](#)
- g) XY robot, see [G. XY-ROBOT](#)
- h) Tray trolley, see [H. TRAY TROLLEY](#)
- i) Fluxer, see [I. FLUXER](#) .

CHAPTER A2 Safety

A2.1 General

For the correct and safe use of this machine, it is essential that all personnel should follow the safety procedures specified in this manual.

All manuals have danger, warning and cautionary statements where applicable.

Danger, warning and cautionary statements and / or symbols are present on the machine where applicable.

A2.2 Personnel qualification

Operation, adjustment, maintenance and repair of this machine shall be carried out by **qualified and trained** personnel only.

The following training levels are defined:

- Operator level.
- User or supervisor level.
- Maintenance or service level.



NOTE: For each level an official Assembléon training is available.

A2.3 Basic safety rules

- Do not use the machine in an environment where flammable gasses are present or where it is extremely dirty.
- When any personal protection equipment (PPE) is mentioned, it should be used in accordance with the manufacturers instructions.
- Do not defeat or bridge safety devices, connectors etc.
- Use only Assembléon recommended spares and tools.
- Keep fingers and other body parts outside the machine.

A2.4 Safety compliance

The safety of this machine is based on industry-specific criteria (international codes, regulations, and standards).

Since this machine is designed for operation in a flow line, full mechanical safety in accordance with these criteria is only guaranteed when openings of the run-in and run-out sections are covered by the preceding and succeeding equipment in the flow line.

This machine should not be operated as a stand-alone machine.

A2.5 Danger, warning and caution

■ Danger

Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

A danger statement is displayed in this manner:



HAZARD IDENTIFICATION

Hazard consequence.
Hazard avoidance.

■ Warning

Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

A warning statement is displayed in this manner:



HAZARD IDENTIFICATION

Hazard consequence.
Hazard avoidance.

■ Caution

Caution indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

A caution statement is displayed in this manner:



HAZARD IDENTIFICATION

Hazard consequence.
Hazard avoidance.

A2.6 Safety stickers




Pictogram	Category	Meaning
	1 Warning	DANGER OF CLAMPING FINGERS Serious injury to fingers. Keep hands away from moving parts.
	2 Warning	DANGER OF STRONG MAGNETIC FIELD Pacemaker and metal prosthetic users are at risk of serious injury or death. Stay away from the magnets.
	3 Warning	DANGER, HIGH VOLTAGE Contact may cause electric shock or burn. Turn off & lock out system before servicing.

Figure 1 Safety stickers

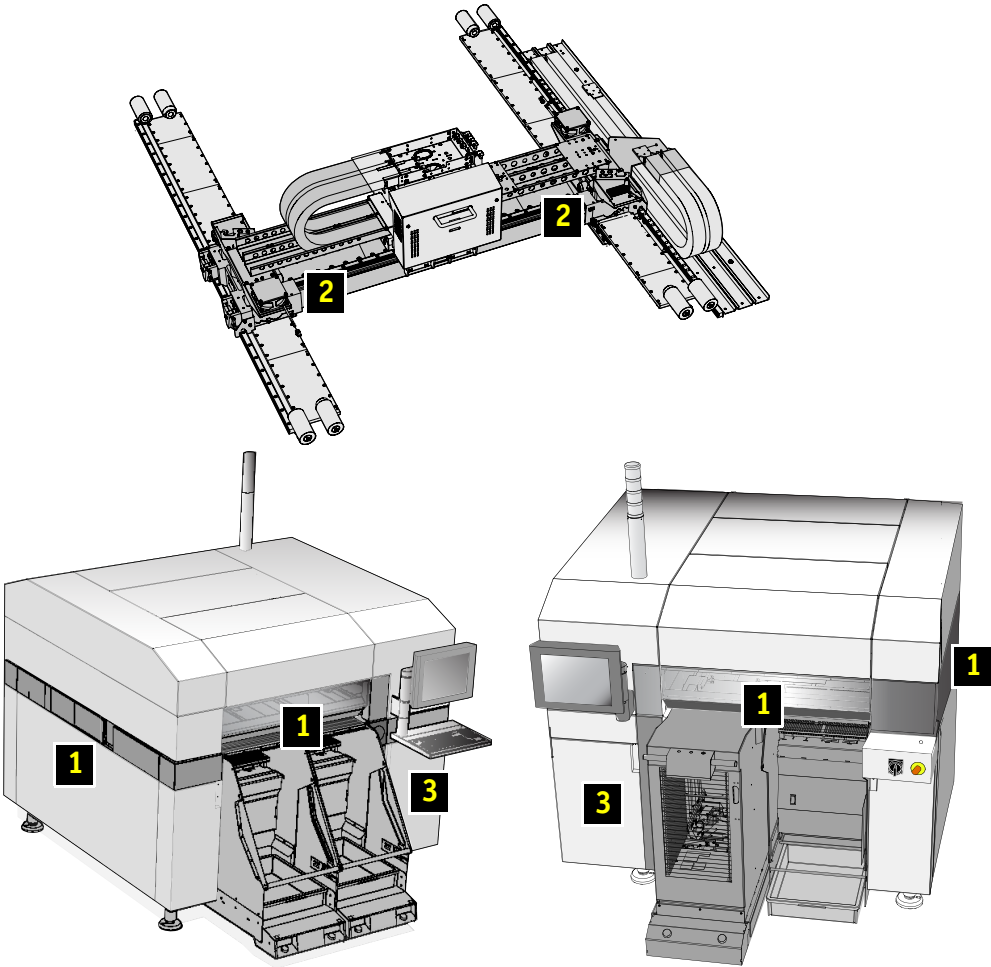


Figure 2 Location of safety stickers

A2.7 Safety devices

	Safety device	Hazard protected	Detection method	Machine condition after safety device is activated
1	Emergency stop button front and rear	Hazardous moving parts.	Safety circuit interruption by pushing the emergency stop button.	All moving parts will be stopped and power to servo systems is turned off.
2	Safety interlock.	Hazardous moving parts.	Safety circuit interruption by opening hood rear.	
3			Safety circuit interruption by opening hood front.	
4			Safety circuit interruption by lowering any trolley.	
5			Safety circuit interruption by removing any trolley lift cover.	
6	"Start on" button. PA 2410/00 only.	Uncontrolled power up	Preventing uncontrolled power up of machine after power failure.	Power to the machine is turned on.
7	Electrical disconnect.	Hazardous voltage.	Mains power supply to the machine interruption by turning the electrical main switch to 'off'.	All power to the machine is turned off.
8	Air disconnect.	Hazardous air pressure.	Main air supply to the machine interruption by turning the main air switch to 'off'.	All air pressure to the machine is turned off, and present air pressure is released safely.
9	Enabling switch front and rear	Hazardous moving parts	Device for running the machine with the front or rear hood opened, when troubleshooting, teaching or servicing. See A2.7.1.Enabling switch front/rear, usage	The XY robot runs at 12.5 % of its normal speed.

Figure 3 Safety devices

Locations of safety devices are depicted in [Figure 4](#) and [Figure 5](#).

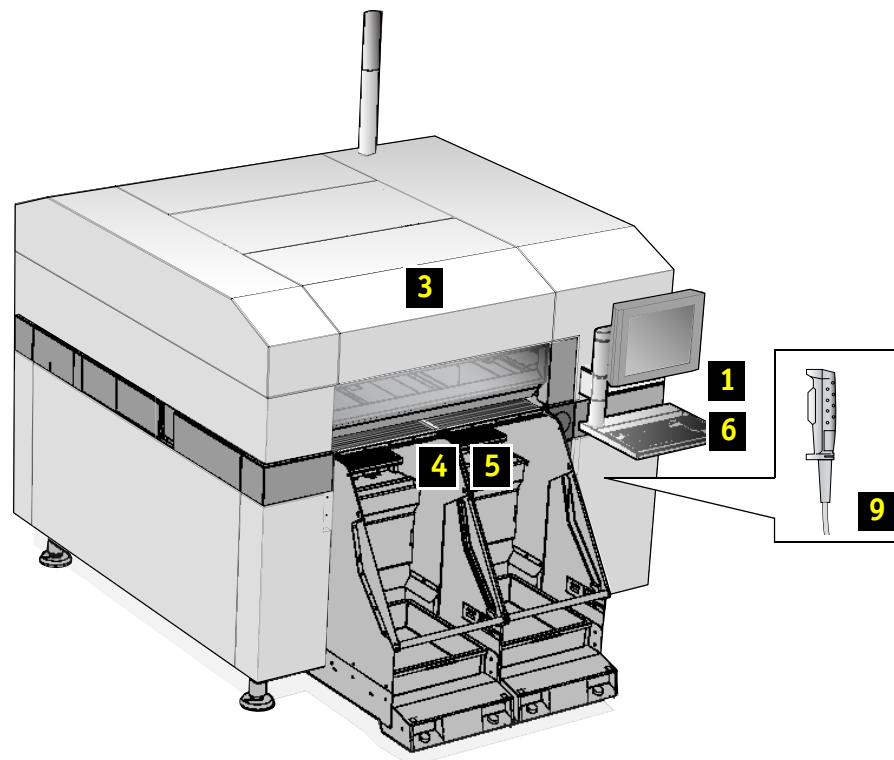


Figure 4 Location of safety devices, front

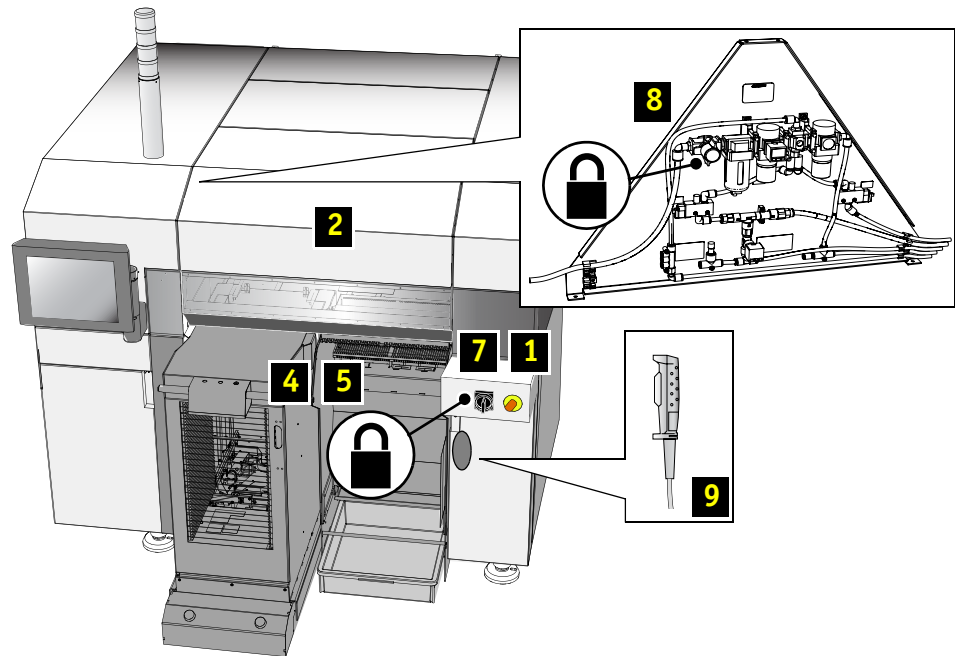


Figure 5 Location of safety devices, rear

Lock the electrical main switch (7) and the air main switch (8) by a padlock to avoid unauthorized use.

A2.7.1 Enabling switch front/rear, usage



DANGER OF MOVING PARTS

Serious injury to fingers and body parts.
Keep fingers and body parts outside the machine.

Use the enabling switch (1) only as a hold-to-run device to suspend the safety function of the hood (2). Keep fingers and other body parts outside the machine when using the enabling switch (1).

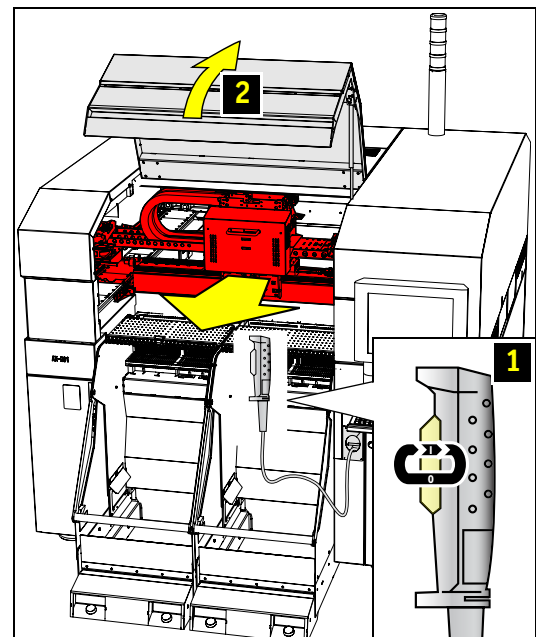
For teaching pick positions or for trouble shooting the machine can be operated with the hood (2) in opened position by using the enabling switch (1).

XY robot operation with open hood (2) is only possible when the enabling switch (1) is held in the middle position.

The XY robot (3) will run at 12.5 % of its normal speed.

Releasing the enabling switch (1) or squeezing the switch blocks further XY robot operation.

Each hood (front/rear) has its own enabling switch (front/rear).



A2.8 Noise levels

Location	Noise level
Sound pressure at operator's position	≤ 72 dB(A)
Average environmental noise level during measurement	≤ 58 dB(A)

Figure 6 Noise levels

A2.9 Emergency contact

In case assistance is needed during an emergency situation, contact the regional Assembléon organization.

Region	Number
Asia	+65-62-61-4611
America's	+1-800-474-4547
Europe	+31-20-5040679

Figure 7 Numbers

A2.10 Liability

Assembléon will not be liable for any costs, damages or personal injuries if the machine is not used according to the safety rules given in this manual.
Instructions written in English are original instructions.
Instructions written in other languages are a translation of the original.

A2.11 Recommended tools for working safely




Description	Picture	Application
1 Stepstool		Useful for smaller persons: reaching inside the machine or closing hoods.
2 Pallet truck		Lifting and moving of heavy modules.
3 Gloves		Skin protection during lubrication.

Figure 8 Recommended tools for working safely

A2.12 Material safety data sheets (MSDS)

For reason of environmental awareness, there is a growing demand for information on the ingredients of the maintenance materials (cleaning agents, lubricants etc.).

The relevant material safety data sheets (MSDS) are enclosed in this section.

Overview of used cleaning materials, lubricants etc.:

Code number	Supplier	Trade name	General description	MSDS no.
1311 504 84102	LOCTITE	LOCTITE 243, 50ml	SEALING AND LOCKING AGENT	08273
5322 390 10151	PHILIPS	ISOFLEX TOPAS NCA 52	BALL AND PLAIN BEARING GREASE	08189
9498 396 00143	PHILIPS	CMD ANTI-SCORING EP LUBE 3	LITHIUM GREASE	01583
5322 390 20159	PHILIPS	NSK GREASE NO. 1 (LR3)	GREASE	10138
1322 530 68801	PHILIPS	ETHANOL	ETHANOL, DENATURATED	00397
1322 526 41801	PHILIPS	MOLYKOTE	METAL PROTECTOR	12803
1303 500 42001	PHILIPS	MOLYKOTE DX	GREASE	14960
1322 534 33801	RHENUS	RHENUS NORLITH STM 2	BALL BEARING GREASE	24515
9498 396 02001	IKO	GREASE MG10-MT2	GREASE	10137

Figure 9 Maintenance materials

On the following pages the concerned MSDS sheets.

MATERIAL SAFETY DATA SHEET

According EC 91/155

1. Identification of the substance/preparation

MSDS : 01583
Code number : 5322 390 20157
Supplier : PHILIPS CONSUMER SERVICE
Tradenam e : CMD ANTI-SCORING EP LUBE 3
General description : LITHUIM GREASE
Emergency phonenumber +31 40 2755555

2. Composition/information on ingredients

Component	CAS-number	Percentage	EC-label
1 PETROLEUM HYDROCARBON	64741-95-3	59.0%	
2 PETROLEUM WAX	63231-60-7	14.0%	
3 RESIN ESTER	65997-13-9	5.0%	
4 POLYOXY ETHYLENE DINONYL PHENYL ETHER PHOSPHATE	39464-64-7	22.0%	

3. Hazards identification

- Product contains components that are on the black list surface water.
-

4. First-aid measures

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, foam, extinguishing powder, water spray.
Hazardous decomposition products in fire : phosphorus oxide, phosphine, carbon monoxide, nitrous oxides.

6. Accidental release measures

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Procedure by spillage : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.

7. Handling and storage

Local exhausting : Under normal circumstances not applicable.

Storage conditions : Keep packing closed.

Do not store product close to ignition or heat sources.

8. Exposure controls/personal protection

Exposure limits (20 Cel. and 1013 mbar) :

TLV : 5 mg/m³ PETROLEUM HYDROCARBON (as oil aerosol)

Remarks exposure limits :
none

Odeur threshold (20 Cel. and 1013 mbar) :
not traceable

Advised personal protection

skin : butyl rubber gloves.

eyes : safety goggles.

inhalation : none (when used normally).

9. Physical and chemical properties

Physical state	: paste
Colour	: type dependent
Odour	: specific
Boiling point/range (Cel.)	: 119
Melting point/range (Cel.)	: 54
Flash point/range (Cel.)	: 229
Explosive limits	: LEL: 0.9 vol.% UEL: 7.0 vol.%
Dust explosions possible in air	: not applicable
Density at 20 Cel.	: 951 kg/m ³
Vapour pressure in kPa	: 0,04 (93 Cel)
Solubility in water	: none
pH	: not applicable
Viscosity	: > 150 mPa.s
Autoignition temperature (Cel.)	: > 300
Electrostatic charge	: no
Log Po/w :	: 3,9-6 PETROLEUM HYDROCARBON > 6 PETROLEUM WAX

10. Stability and reactivity

Conditions to avoid	: none
Reaction with water	: no
Hazardous reactions with	: strong oxidizers.
Hazardous decomposition products at heating	: phosphor compounds.

11. Toxicological information

Symptoms

Skin local : With intensive skin contact risk of skin affection.
 general : No absorption worth mentioning under normal working conditions.

Ingestion local : The substance is prickling: abdominal pain, nausea.
 No symptoms under normal working conditions.
 general : No absorption worth mentioning under normal working conditions.

Inhalation local : The substance is with atomising prickling: coughing.
 general : No absorption worth mentioning under normal working conditions.

Eyes local : The substance is prickling: redness, pain.

Remarks symptoms : None

Toxicity : LD-50 unknown

12. Ecotoxicological information

Biochemical oxygen demand : not traceable
 Chemical oxygen demand : not traceable
 Ecotoxicity : LC-50: > 1000 mg/l/96h (Fish) PETROLEUM
 HYDROCARBON
 EC-50: > 1000 mg/l/48h (Daphnia) PETROLEUM
 HYDROCARBON

Remarks on ecotoxicity : none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation. Consider also return delivery to supplier.

14. Transport information

Class/figure RID/ADR : none
 Class IMO : none
 Class ICAO : none
 UN-number : none

15. Regulatory information

not applicable

Remarks on EC-labeling : The supplier does not give an EC-label (Userlabel).

16. Other information

Remarks on MSDS : none
 Inner company references : none
 Date last update : 1998-12-02
 Date last update but one : 1997-04-07

The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.

MATERIAL SAFETY DATA SHEET

According EC 91/155

1. Identification of the substance/preparation

MSDS : 08189
Code number : 5322 390 10151
Supplier : PHILIPS CONSUMER SERVICE
Tradename : ISOFLEX TOPAS NCA 52
General description : BALL AND PLAIN BEARING GREASE
Emergency phonenumber +31 40 2755555

2. Composition/information on ingredients

Component	CAS-number	Percentage	EC-label
1 SYNTHETIC HYDROCARBONS OIL			
2 CALCIUM SOAP			

3. Hazards identification

4. First-aid measures

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray.
Hazardous decomposition products in fire : carbon monoxide, calcium oxide.

6. Accidental release measures

Procedure by spillage : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.

7. Handling and storage

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Local exhausting : Under normal circumstances not applicable.

Storage conditions : Store product at room temperature.

8. Exposure controls/personal protection

Exposure limits (20 Cel. and 1013 mbar) :
not determined

Remarks exposure limits :
none

Odeur threshold (20 Cel. and 1013 mbar) :
not tracable

Advised personal protection
skin : polyvinyl alcohol gloves.
eyes : safety goggles.
inhalation : none (when used normally).

9. Physical and chemical properties

Physical state	: paste
Colour	: beige
Odour	: specific
Boiling point/range (Cel.)	: not tracable
Melting point/range (Cel.)	: ≥ 180
Flash point/range (Cel.)	: ≥ 200
Explosive limits	: not tracable
Dust explosions possible in air	: not applicable
Density at 20 Cel.	: 850 - 890 kg/m ³
Vapour pressure in kPa	: not tracable
Solubility in water	: none
pH	: not applicable
Viscosity	: not tracable
Autoignition temperature (Cel.)	: not tracable
Electrostatic chargement	: no
Log Po/w :	: not tracable

10. Stability and reactivity

Conditions to avoid	: none
Reaction with water	: no
Hazardous reactions with	: strong oxidizers.
Hazardous decomposition products at heating	: none.

11. Toxicological information

Symptoms

Skin	local	: With intensive skin contact risk of skin affection.
	general	: Not applicable.
Ingestion	local	: The substance is prickling: abdominal pain.
	general	: Not applicable.
Inhalation	local	: Not applicable.

general : Not applicable.
Eyes local : The substance is prickling: redness.
Remarks symptoms : None
Toxicity : LD-50 unknown

12. Ecotoxicological information

Biochemical oxygen demand : not tracable
Chemical oxygen demand : not tracable
Ecotoxicity : none
Remarks on ecotoxicity : none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation. Consider also return delivery to supplier.

14. Transport information

Class/figure RID/ADR : none
Class IMO : none
Class ICAO : none
UN-number : none

15. Regulatory information

not applicable
Remarks on EC-labeling : none

16. Other information

Remarks on MSDS : none
Inner company references : none
Date last update : 1999-07-07
Date last update but one : 1994-08-03

The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.

MATERIAL SAFETY DATA SHEET

According EC 91/155

1. Identification of the substance/preparation

MSDS : 08273
Code number : 1311 504 84102
Supplier : LOCTITE
Tradename : LOCTITE 243, 50 ML
General description : SEALING AND LOCKING AGENT
Emergency phonenumber +31 40 2755555

2. Composition/information on ingredients

Component	CAS-number	Percentage	EC-label
1 POLYETHYLENE GLYCOL DIMETHACRYLATE		30.0- 60.0%	
2 ORGANIC PEROXIDE (CORROSIVE)		1.0-5.0%	O,C; R: 7- 20/22-34
3 PLASTICIZER		10.0- 30.0%	

3. Hazards identification**4. First-aid measures**

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Bring the victim into the fresh air as soon as possible, let rest and if necessary call for a doctor.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.

Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray.
Hazardous decomposition products in fire : carbon monoxide.

6. Accidental release measures

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Procedure by spillage : Absorb the liquid in appropriate absorbent (e.g. Powersorb, dry sand, diatomite, vermiculite etc.), shovel the mixture into plastic bags and remove to the central depot for hazardous waste.

7. Handling and storage

Local exhausting : Under normal circumstances not applicable.

Storage conditions : Store product at a temperature between 8 and 21 degrees Celsius.

8. Exposure controls/personal protection

Exposure limits (20 Cel. and 1013 mbar) :
not determined

Remarks exposure limits :
none

Odeur threshold (20 Cel. and 1013 mbar) :
not tracable

Advised personal protection
skin : butyl rubber gloves.
eyes : safety goggles.
inhalation : none (when used normally).

9. Physical and chemical properties

Physical state	: liquid
Colour	: blue
Odour	: specific
Boiling point/range (Cel.)	: not tracable
Melting point/range (Cel.)	: not tracable
Flash point/range (Cel.)	: >=100
Explosive limits	: not tracable
Dust explosions possible in air	: not applicable
Density at 20 Cel.	: 1080 kg/m3
Vapour pressure in kPa	: <0,01 (25 Cel.)
Solubility in water	: none
pH	: not applicable
Viscosity	: not tracable
Autoignition temperature (Cel.)	: not tracable
Electrostatic chargement	: not tracable
Log Po/w :	: not tracable

10. Stability and reactivity

Conditions to avoid	: none
Reaction with water	: no
Hazardous reactions with	: peroxides.
Hazardous decomposition products at heating	: none.

11. Toxicological information

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Symptoms

Skin local : May cause allergic reaction: chance of allergic dermatitis.
With intensive skin contact risk of skin affection.

general : Probably no absorption worth mentioning.

Ingestion local : Produces probably no symptoms.

general : Produces probably no symptoms.

Inhalation local : Produces probably no symptoms.

general : Produces probably no symptoms.

Eyes local : The substance is prickling: redness.

Remarks symptoms : None

Toxicity : LD-50: > 5 g/kg (ORL-RAT), TOTAL PRODUCT

12. Ecotoxicological information

Biochemical oxygen demand : not traceable

Chemical oxygen demand : not traceable

Ecotoxicity : none

Remarks on ecotoxicity : none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation. Consider also return delivery to supplier.

14. Transport information

Class/figure RID/ADR : none

Class IMO : none

Class ICAO : none

UN-number : none

15. Regulatory information

not applicable

Remarks on EC-labeling : none

16. Other information

Remarks on MSDS : none

Inner company references : BXV 11-49

Date last update : 1999-12-01

Date last update but one : 1997-08-01

The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.

MATERIAL SAFETY DATA SHEET

According EC 91/155

1. Identification of the substance/preparation

MSDS : 10138
Code number : 5322 390 20159
Supplier : PHILIPS CONSUMER SERVICE
Tradename : NSK GREASE NO.1
General description : GREASE

Emergency phonenumber +31 40 2755555

2. Composition/information on ingredients

	Component	CAS-number	Percentage	EC-label
1	SYNTHETIC OIL		73.0-78.0%	
2	LITHIUM SOAP		21.0-23.0%	
3	ANTI OXIDANT		1.0-3.0%	
4	INHIBITORS		0.5-1.5%	

3. Hazards identification

4. First-aid measures

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray.
Hazardous decomposition products in fire : carbon monoxide, nitrous oxides.

6. Accidental release measures

Procedure by spillage : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.

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7. Handling and storage

Local exhausting : Under normal circumstances not applicable.

Storage conditions : Do not store product close to ignition sources.

8. Exposure controls/personal protection

Exposure limits (20 Cel. and 1013 mbar) :

TLV : 5 mg/m³ SYNTHETIC OIL (as oil aerosol)

Remarks exposure limits :

none

Odeur threshold (20 Cel. and 1013 mbar) :

not traceable

Advised personal protection

skin : butyl rubber gloves.

eyes : safety goggles.

inhalation : none (when used normally).

9. Physical and chemical properties

Physical state	: paste
Colour	: white
Odour	: almost odourless
Boiling point/range (Cel.)	: not applicable
Melting point/range (Cel.)	: see info. section 16 SDS.
Flash point/range (Cel.)	: 225
Explosive limits	: not applicable
Dust explosions possible in air	: not applicable
Density at 20 Cel.	: 920 kg/m ³
Vapour pressure in kPa	: < 0,1
Solubility in water	: none
pH	: not applicable
Viscosity	: > 150 mPa.s
Autoignition temperature (Cel.)	: > 300
Electrostatic charge	: no
Log Po/w :	: not traceable

10. Stability and reactivity

Conditions to avoid	: none
Reaction with water	: no
Hazardous reactions with	: oxidizing substances, strong acids.
Hazardous decomposition products at heating	: none.

11. Toxicological information

Symptoms

Skin local : With intensive skin contact risk of skin affection.
 general : Not applicable.

Ingestion local : No symptoms under normal working conditions.
 general : No absorption worth mentioning under normal working conditions.

Inhalation local : Not applicable.
 general : Not applicable.

Eyes local : The substance is prickling: redness.

Remarks symptoms : None

Toxicity : LD-50 unknown

12. Ecotoxicological information

Biochemical oxygen demand : not traceable
Chemical oxygen demand : not traceable
Ecotoxicity : none
Remarks on ecotoxicity : none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation. Consider also return delivery to supplier.

14. Transport information

Class/figure RID/ADR : none
Class IMO : none
Class ICAO : none
UN-number : none

15. Regulatory information

not applicable

Remarks on EC-labeling : The supplier does not give an EC-label (Userlabel).

16. Other information

Remarks on MSDS : At temperatures above 190 degrees Celsius the product becomes soft.
Inner company references : none
Date last update : 1998-12-02
Date last update but one : 1997-03-25

The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.



PHILIPS

MATERIAL SAFETY DATA SHEET

According EC 91/155

1. Identification of the substance/preparation

MSDS : 00397
Product code 12nc : 1322 530 68801
Supplier : CHEMPROHA CHEMIEPARTNER B.V.
 POSTBUS 872
 3300 AW ZWIJNDRECHT
 Netherlands
 Tel: 078-6544944
 Fax: 078-6191399
Tradename : ETHANOL 99,8%, DENATURATED WITH 5% METHANOL 1-24009
General description : ETHANOL, DENATURATED
Use : Miscellaneous
Publicationdate : 2003-03-05
Emergency phonenumber +31 (0)497-598315

2. Composition/information on ingredients

Component	CAS-number	EC-number	Percentage	EC-label
ETHANOL	64-17-5	200-578-6	≥90.0 -≤97.0 %	F;R: 11
METHANOL	67-56-1	200-659-6	≥3.0 -≤10.0 %	F,T;R: 11-23/24/25-39/23/24/25

3. Hazard identification



R-phrases

- Highly flammable.
- Harmful by inhalation, in contact with skin and if swallowed.
- Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.

4. First-aid measures

Skin : Remove contaminated clothes as soon as possible. Remove residue substance as soon as possible (f.i. rinse with much water). In case of a serious exposure call for a doctor.
Ingestion : If victim is conscious let him drink 1 or 2 glasses of water. In case of general disorders bring victim into the hospital, otherwise call for a doctor.
Inhalation : Bring victim into the fresh air as soon as possible and let rest. In case of severe exposure call for a doctor. In case of breathing problems, loose squeezing clothes and if victim is conscious bring victim in high sitting position. In case of stagnation of breathing give IMMEDIATELY oxygen and transport to hospital as soon as possible.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, water spray, alcohol resistant foam
Hazardous decomposition products in fire : carbon monoxide

6. Accidental release measures

Spillage procedure : Absorb the liquid in appropriate absorbent (e.g. Powersorb, dry sand, diatomite, vermiculite etc.), shovel the mixture into plastic bags and remove to the central depot for hazardous waste.
Emergency procedure : not applicable

7. Handling and storage

Local exhausting : Depends on processing circumstances, but at least good room ventilation.
Storage conditions : Keep container in a well-ventilated place.
 Keep away from sources of ignition - No smoking.
 Keep packing closed.
 Store product in a cool, dry and well ventilated area.

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8. Exposure controls/personal protection

Exposure limits :		
TLV:	1000 mg/m3	ETHANOL
	applicable to: Netherlands (20 °C; 1013 mbar)	
TLV:	1907 mg/m3	ETHANOL
	applicable to: Belgium (20 °C; 1013 mbar)	
TLV:	1900 mg/m3	ETHANOL
	applicable to: Germany (20 °C; 1013 mbar)	
TLV:	1880 mg/m3	ETHANOL
	applicable to: United States (25 °C; 1013 mbar)	
TLV:	266 mg/m3	S METHANOL
STEL:	333 mg/m3	S METHANOL
	applicable to: Belgium (20 °C; 1013 mbar)	
TLV:	260 mg/m3	S METHANOL
STEL:	330 mg/m3	S METHANOL
	applicable to: United States (25 °C; 1013 mbar)	
TLV:	270 mg/m3	S METHANOL
	applicable to: Germany (20 °C; 1013 mbar)	
* TLV:	260 mg/m3	S METHANOL
STEL:	520 mg/m3	S METHANOL
	applicable to: Netherlands (20 °C; 1013 mbar)	

C=Ceiling; S=Skin

Remarks exposure limits :
none

Odour threshold (20°C; 1013 mbar) :
≥96 -≤220.8 mg/m3 ETHANOL
≥5.586 -≤7980 mg/m3 METHANOL

Advised personal protection :
skin : butyl rubber gloves
neoprene gloves
eyes : safety goggles
inhalation : none (when sufficient exhausting)

9. Physical and chemical properties

Physical state	: liquid
Colour	: colourless
Odour	: alcoholic
Vapor rate/range	: not traceable
Boiling point/range	: ≥65 °C -≤78 °C (1013 mbar)
Melting point/range	: ≥-117 °C -≤-98 °C
Flash point/range	: ≥11 °C -≤12 °C
Explosive limits	: LEL:≥3.4 vol.% -UEL:≤36.5 vol.%
Dust explosions possible in air	: not applicable
Relative density	: ≥0.79000 -≤0.81 (water=1) (20 °C)
Vapour pressure	: 12.7 kPa (20 °C)
Solubility in water	: complete
Solubility in fat	: not traceable
pH	: ≥5 -≤9
Viscosity	: 1.22 mPa.s (20 °C)
Autoignition temperature	: ≥370 °C -≤455 °C
Decomposition temperature	: not traceable
Electrostatic chargement	: not traceable

10. Stability and reactivity

Conditions to avoid	: none
Reactions with water	: no
Hazardous reactions with	: oxidizing substances, alkaline earth metals, alkali metals, alkali oxides
Hazardous decomposition products at heating	: none

11. Toxicological information

Symptoms		
Skin	local	: The substance is prickling: redness.
		: Degreasing: in case of sustained contact a rough, dry skin, eczema.
	general	: Probably no absorption worth mentioning.
Ingestion	local	: The substance is prickling: sore throat.
		: No symptoms under normal working conditions.
	general	: The substance may be absorbed after ingestion.
Inhalation		: The substance is intoxicating: headache, drowsiness, dizziness. Large quantities may cause: unconsciousness, agitation.
	local	: The vapour is prickling: sore throat, coughing.
	general	: The vapour may be absorbed by inhalation.
Eyes	local	: For phenomena, see ingestion general.
Remarks symptoms		: The substance is prickling: redness, pain.
		: After prolonged exposure possibly effects on: the nervous system.

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Toxicity :

LD-50: 7.06 g/kg (ORL-RAT), ETHANOL
 LD-50: >20 g/kg (SKN-RBT), ETHANOL
 LC-50: 124.7 mg/l/4H (IHL-RAT), ETHANOL
 LD-50: 5.628 g/kg (ORL-RAT), METHANOL
 LC-50: 83.8 mg/l/4H (IHL-RAT), METHANOL
 LD-50: 15.8 g/kg (SKN-RBT), METHANOL

Source : IUCLID
Source : ChemDat (Merck)
Source : IUCLID
Source : IUCLID
Source : IUCLID
Source : IUCLID

Ames test : not traceable

12. Ecotoxicological information

Biological oxygen demand (5) : 0.97 g/g ETHANOL
 0.6 g/g METHANOL
Chemical oxygen demand : 1.70 g/g ETHANOL
 1.42 g/g METHANOL
Biological(5)/chemical oxygen demand ratio : 0.57 ETHANOL
 0.42 METHANOL
Degradability : easy degradable ETHANOL
 easy degradable METHANOL
Biochemical factor : 0.66 ETHANOL
 <10 METHANOL
Log Po/w : -0.32 ETHANOL
 -0.77 METHANOL
Henry Constant : not traceable

Source : IUCLID
Source : IUCLID
Source : IUCLID
Source : IUCLID
Source : ChemDat (Merck)
Source : ChemDat (Merck)
Source : ChemDat (Merck)
Source : IUCLID
Source : IUCLID
Source : IUCLID

Ecotoxicity :

LC-50: 11000 mg/l/96H (Fish), ETHANOL
 EC-50: ≥9268 -≤14221 mg/l/48H (Daphnia), ETHANOL
 LC-50: 15400 mg/l/96H (Fish), METHANOL
 EC-50: >10000 mg/l/48H (Daphnia), METHANOL

Source : IUCLID
Source : IUCLID
Source : IUCLID
Source : ChemDat (Merck)

Remarks on ecotoxicity : none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation. Consider also return delivery to supplier. Uncleaned empty packagings may contain inflammable and/or explosive mixtures.

14. Transport information

ADR/RID **UN-number** : 1170 ETHANOL SOLUTION
Class : 3
Packinggroup : III
Transport emergency card : 30S1170
IMO **UN-number** : 1170 ETHANOL SOLUTION
Class : 3
Packinggroup : III
Marine pollutant : no
IATA/ICAO **UN-number** : 1170 ETHANOL SOLUTION
Class : 3
Packinggroup : III

15. Regulatory information

Hazard symbol
 F (HIGHLY FLAMMABLE)
 Xn (HARMFUL)
R-phrases
 11 Highly flammable.
 20/21/22 Harmful by inhalation, in contact with skin and if swallowed.
 68/20/21/22 Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.
S-phrases
 9 Keep container in a well-ventilated place.
 16 Keep away from sources of ignition - No smoking.
 36/37 Wear suitable protective clothing and gloves.
Hazardous component(s) : METHANOL
Remarks on EC-labeling : The supplier may give a different EC-label (Userlabel).

16. Other information

Remarks on MSDS : none
Inner company references : none

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Overview relevant R-sentences from all components in section 2 :

11	Highly flammable.
23/24/25	Toxic by inhalation, in contact with skin and if swallowed.
39/23/24/25	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Date last update : 2004-01-19

* Point to alterations with regard to the previous version.

The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.

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MATERIAL SAFETY DATA SHEET

According EC 91/155

1. Identification of the substance/preparation

MSDS : 12803
Product code 12nc : 1322 526 41801
Supplier : DOW CORNING
 62, RUE GENERAL DE GAULLE
 1310 TERHULPEN
 Belgium
 Tel: +32-2-655-2523
 Fax: +32-2-655-2002
Tradename : MOLYKOTE METAL PROTECTOR PLUS
General description : WAX SOLUTION
Use : Miscellaneous
Publicationdate : 2003-03-05
Emergency phonenumber +31 (0)497-598315

2. Composition/information on ingredients

Component	CAS-number	EC-number	Percentage	EC-label
STODDARD SOLVENT (C6H6 <0.1%)	8052-41-3	232-489-3		Xn;R: 10-65
WAX				

3. Hazard identification

R-phrases
 • Flammable.

4. First-aid measures

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Bring the victim into the fresh air as soon as possible, let rest and if necessary call for a doctor.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray
Hazardous decomposition products in fire : carbon monoxide

6. Accidental release measures

Spillage procedure : Absorb the liquid in appropriate absorbent (e.g. Powersorb, dry sand, diatomite, vermiculite etc.), shovel the mixture into plastic bags and remove to the central depot for hazardous waste.
Emergency procedure : not applicable

7. Handling and storage

Local exhausting : Depends on processing circumstances, but at least good room ventilation.
Storage conditions : Store product in a well ventilated area.
 Do not store product close to ignition sources.

8. Exposure controls/personal protection

Exposure limits :
 TLV: 575 mg/m3 STODDARD SOLVENT (C6H6 <0.1%)
 applicable to: Netherlands (20 °C; 1013 mbar)
 TLV: 533 mg/m3 STODDARD SOLVENT (C6H6 <0.1%)
 applicable to: Belgium (20 °C; 1013 mbar)
 TLV: 570 mg/m3 STODDARD SOLVENT (C6H6 <0.1%)
 applicable to: United States (25 °C; 1013 mbar)
 not determined WAX
 C=Ceiling; S=Skin

Remarks exposure limits :
 none

Odour threshold (20°C; 1013 mbar) :
 not traceable

Advised personal protection :
 skin : butyl rubber gloves
 eyes : safety goggles
 inhalation : none (when sufficient exhausting)

9. Physical and chemical properties

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Physical state	: liquid
Colour	: yellow
Odour	: like solvents
Vapor rate/range	: not traceable
Boiling point/range	: The product decomposes before it boils.
Melting point/range	: not traceable
Flash point/range	: 28 °C
Explosive limits	: not traceable
Dust explosions possible in air	: not applicable
Relative density	: 0,81000 (water=1) (20 °C)
Vapour pressure	: not traceable
Solubility in water	: none
Solubility in fat	: not traceable
pH	: not applicable
Viscosity	: not traceable
Autoignition temperature	: not traceable
Decomposition temperature	: >150 °C
Electrostatic chargement	: not traceable

10. Stability and reactivity

Conditions to avoid	: none
Reactions with water	: no
Hazardous reactions with	: strong oxidizers
Hazardous decomposition products at heating	: formaldehyde

11. Toxicological information

Symptoms		
Skin	local	: The substance is prickling: redness.
		: Degreasing: in case of sustained contact a rough, dry skin, eczema.
Ingestion	general	: No absorption worth mentioning under normal working conditions.
	local	: The substance is prickling: abdominal pain, vomiting, diarrhoea, coughing.
Inhalation		: Chance of pulmonary affections if choked.
	general	: No symptoms under normal working conditions.
		: For phenomena, see inhalation general.
		: No absorption worth mentioning under normal working conditions.
	local	: The vapour is prickling: sore throat, coughing, shortness of breath.
	general	: The vapour may be absorbed by inhalation.
Eyes		: The vapour is intoxicating: drowsiness. Large concentrations may cause: restricted awareness.
	local	: The substance is prickling: redness, pain.
Remarks symptoms		: None
Toxicity		: LD-50: >5 g/kg (ORL-RAT), STODDARD SOLVENT (C6H6 <0.1%)

12. Ecotoxicological information

Biological oxygen demand (5)	: not traceable
Chemical oxygen demand	: not traceable
Biological/chemical oxygen demand ratio	: not traceable
Biochemical factor	: not traceable
Log Po/w	: not traceable
Ecotoxicity	: not traceable
Remarks on ecotoxicity	: none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation. Consider also return delivery to supplier. Uncleaned empty packagings may contain inflammable and/or explosive mixtures.

14. Transport information

* ADR/RID	UN-number	: 1993 FLAMMABLE LIQUID, N.O.S. (STODDARD SOLVENT (C6H6 <0.1%))
	Class	: 3
	Packinggroup	: III
	Transport emergency card	: 30GF1-III
* IMO	UN-number	: 1993 FLAMMABLE LIQUID, N.O.S. (STODDARD SOLVENT (C6H6 <0.1%))
	Class	: 3
	Packinggroup	: III
	Marine pollutant	: no
* IATA/CAO	UN-number	: 1993 FLAMMABLE LIQUID, N.O.S. (STODDARD SOLVENT (C6H6 <0.1%))
	Class	: 3
	Packinggroup	: III

15. Regulatory information

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Hazard symbol	none
R-phrases	10 Flammable.
S-phrases	23.2 Do not breath vapour. 24 Avoid contact with skin. 43.13 In case of fire, use carbon dioxide, powder extinguisher, foam or water spray. 62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.
Hazardous component(s)	: not applicable
Remarks on EC-labeling	: The supplier may give a different EC-label (Userlabel).

16. Other information

Remarks on MSDS	: none
Inner company references	: none
Overview relevant R-sentences from all components in section 2 :	
10	Flammable.
65	Harmful: may cause lung damage if swallowed.
Date last update	: 2003-03-05

* Point to alterations with regard to the previous version.
The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of at the date of its printing.

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PHILIPS

MATERIAL SAFETY DATA SHEET

According EC 91/155

1. Identification of the substance/preparation

MSDS : 14960
Product code 12nc : 1303 500 42001
Supplier : DOW CORNING
 62, RUE GENERAL DE GAULLE
 1310 TERHULPEN
 Belgium
 Tel: +32-2-655-2523
 Fax: +32-2-655-2002
Tradename : MOLYKOTE DX
General description : LUBRICATING PASTE
Use : Various
Publicationdate : 2001-01-05
General information : dangerous.goods@philips.com
Emergency phonenumber : +31 (0)497-598315

2. Hazard identification

* R-phrases

- Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

3. Composition/information on ingredients

Component	CAS-no	EC-no	Catalogue-no	Percentage(%)	EC-label
* DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)	64742-52-5	265-155-0	649-465-00-7	23.0	Xn;R: 65
* DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	64741-96-4	265-097-6	649-457-00-3	17.0	Xn;R: 65
* DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)	64742-54-7	265-157-1	649-467-00-8	6.0	Xn;R: 65
* DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	64742-65-0	265-169-7	649-474-00-6	6.0	Xn;R: 65
* DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	64741-88-4	265-090-8	649-454-00-7	6.0	Xn;R: 65
ZINC OXIDE	1314-13-2	215-222-5	030-013-00-7	2.0	N;R: 50/53
* N-ALKYL (C16-C18) TRIMETHYLENEDIAMINE	68153-99-1	268-902-9		3.0	C;R: 22 34

4. First-aid measures

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray
Unsuitable fire-extinguisher : not traceable
Special fire-fighting equipment : In the event of fire, wear protective clothing and use breathing apparatus that is independent of the ambient air.
*** Hazardous decomposition products in fire** : carbon monoxide, nitrous oxides, zinc oxide

6. Accidental release measures

Spillage procedure : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.
Emergency procedure : not applicable

7. Handling and storage

Local exhausting : Under normal circumstances not applicable.
Storage conditions : Store product in a well ventilated area, dry.
Storage code (on behalf of PGS 15) : none

8. Exposure controls/personal protection

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Exposure limits :

applicable to: The Netherlands (20 °C; 1013 mbar)		
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)(as oil aerosol) (Statutory threshold limit value)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)(as oil aerosol) (Statutory threshold limit value)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol) (Statutory threshold limit value)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol) (Statutory threshold limit value)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol) (Statutory threshold limit value)
TWA(8 hours):	5 mg/m3	ZINC OXIDE(as fume)
No TWA has been laid down.		N-ALKYL (C16-C18) TRIMETHYLENEDIAMINE
applicable to: Belgium (20 °C; 1013 mbar)		
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)(as oil aerosol)
TWA(15 minutes):	10 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)(as oil aerosol)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)(as oil aerosol)
TWA(15 minutes):	10 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)(as oil aerosol)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol)
TWA(15 minutes):	10 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol)
TWA(15 minutes):	10 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol)
TWA(8 hours):	5 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol)
TWA(15 minutes):	10 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)(as oil aerosol)
TWA(8 hours):	5 mg/m3	ZINC OXIDE(as fume)
TWA(15 minutes):	10 mg/m3	ZINC OXIDE(as fume)
TWA(8 hours):	10 mg/m3	ZINC OXIDE(as dust)
applicable to: Germany (20 °C; 1013 mbar)		
TWA(8 hours):	500 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)(carbonhydrogen mix, group 2)
TWA(8 hours):	1000 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)(carbonhydrogen mix, group 1)
TWA(8 hours):	1000 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)(carbonhydrogen mix, group 1)
TWA(8 hours):	1000 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)(carbonhydrogen mix, group 1)
TWA(8 hours):	1000 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)(carbonhydrogen mix, group 1)
applicable to: United States of America (25 °C; 1013 mbar)		
TWA(8 hours):	0.2 mg/m3	DISTILLATES (PETROLEUM),

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TWA(8 hours):	0.2 mg/m3	HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)(as mineral oil, inhalable dust)
TWA(8 hours):	0.2 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)(as mineral oil, inhalable dust)
TWA(8 hours):	0.2 mg/m3	DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)(as mineral oil, inhalable dust)
TWA(8 hours):	0.2 mg/m3	DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)(as mineral oil, inhalable dust)
TWA(8 hours):	2 mg/m3	ZINC OXIDE(as respirable fume)
TWA(15 minutes):	10 mg/m3	ZINC OXIDE(as respirable fume)

C=Ceiling; S=Skin

Remarks exposure limits :
none

Odour threshold (20°C; 1013 mbar) :
not traceable

DNEL (Derived No Effect Level)

not traceable

PNEC (Predicted No Effect Concentration)

not traceable

Advised personal protection :

Hands	:	polyvinyl alcohol gloves
Eyes	:	safety goggles
Inhalation	:	none (when sufficient exhausting)
Skin	:	none (when used normally)

9. Physical and chemical properties

Physical state	:	paste
Colour	:	white
Odour	:	almost odourless
Vapor rate/range	:	not traceable
Boiling point/range	:	not traceable
Melting point/range	:	not traceable
Flash point/range	:	≥100 °C
Explosive limits	:	not traceable
Dust explosions possible in air	:	not applicable
Relative density	:	1.14000 (water=1) (20 °C)
Vapour pressure	:	not traceable
Solubility in water	:	none
Solubility in fat	:	not traceable
pH	:	not applicable
Viscosity	:	not traceable
Autoignition temperature	:	not traceable
Decomposition temperature	:	>150 °C
* Electrostatic charge	:	no

10. Stability and reactivity

Conditions to avoid	:	none
Reactions with water	:	no
Hazardous reactions with	:	oxidizing substances
Hazardous decomposition products at heating	:	formaldehyde

11. Toxicological information

Symptoms

Skin	local	:	With intensive skin contact risk of skin affection.
	general	:	No absorption worth mentioning under normal working conditions.
Ingestion	local	:	No symptoms under normal working conditions.
	general	:	The substance may be absorbed after ingestion.
Inhalation	local	:	No absorption worth mentioning under normal working conditions.
	general	:	The vapour and the fumes are prickling: coughing.
Eyes	local	:	No absorption worth mentioning under normal working conditions.
	general	:	The substance is prickling: redness.
Remarks symptoms		:	None

Toxicity :

LD-50: >2 g/kg (ORL-RAT), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)	Source	:	CONCAWE
LD-50: >2 g/kg (SKN-RBT), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)	Source	:	CONCAWE

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LD-50: >2 g/kg (ORL-RAT), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	Source	: CONCAWE
LD-50: >2 g/kg (SKN-RBT), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	Source	: CONCAWE
LD-50: >2 g/kg (ORL-RAT), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LD-50: >2 g/kg (SKN-RBT), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LD-50: >2 g/kg (ORL-RAT), DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LD-50: >2 g/kg (SKN-RBT), DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LD-50: >2.0 g/kg (ORL-RAT), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LD-50: >2.0 g/kg (SKN-RBT), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LD-50: >5 g/kg (ORL-RAT), ZINC OXIDE	Source	: ChemDat (Merck)

Ames test : not traceable

12. Ecotoxicological information

Biological oxygen demand (5)	: not traceable	
Chemical oxygen demand	: not traceable	
Biological/chemical oxygen demand ratio	: not traceable	
Degradability	: degradable DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	Source : CONCAWE
	: degradable DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	Source : CONCAWE
	: degradable DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source : CONCAWE
Biochemical factor	: not traceable	
Log Po/w	: ≥3.9 - ≤6 DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)	Source : CONCAWE
	: ≥3.9 - ≤6 DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	Source : CONCAWE
	: ≥3.9 - ≤6 DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)	Source : CONCAWE
	: ≥3.9 - ≤6 DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	Source : CONCAWE
	: ≥3.9 - ≤6 DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source : IUCLID
Henry Constant	: not traceable	
Ecotoxicity :		
LC-50: >1000 mg/l/96H (Fish), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)	Source	: CONCAWE
EC-50: >1000 mg/l/48H (Daphnia), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)	Source	: CONCAWE
IC-50: >1000 mg/l/72H (Algae), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY NAPHTHENIC (DMSO <3%)	Source	: CONCAWE
LC-50: >5000 mg/l/96H (Fish), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	Method	: OECD 203
EC-50: >1000 mg/l/48H (Daphnia), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	Source	: IUCLID
IC-50: >1000 mg/l/72H (Algae), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY NAPHTHENIC (DMSO <3%)	Source	: CONCAWE
LC-50: >5000 mg/l/96H (Fish), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)	Method	: OECD 203
EC-50: >1000 mg/l/48H (Daphnia), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)	Source	: IUCLID
IC-50: >1000 mg/l/72H (Algae), DISTILLATES (PETROLEUM), HYDROTREATED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LC-50: >1000 mg/l/96H (Fish), DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
EC-50: >1000 mg/l/48H (Daphnia), DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
IC-50: >1000 mg/l/72H (Algae), DISTILLATES (PETROLEUM), SOLVENT-DEWAXED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LC-50: >1000 mg/l/96H (Fish), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
EC-50: >1000 mg/l/48H (Daphnia), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
IC-50: >1000 mg/l/72H (Algae), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
LC-50: 2246 mg/l/96H (Fish), ZINC OXIDE	Source	: Easi View
Remarks on ecotoxicity	: none	

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13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation.

14. Transport information

Not subject to Transport-regulation Dangerous Substances

15. Regulatory information

Hazard symbol

none

* R-phrases

52/53

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

* S-phrases

61

Avoid release to the environment. Refer to special instructions/Safety data sheets.

Hazardous component(s)

: not applicable

Remarks on EC-labeling

: The supplier may give a different EC-label (Userlabel).

16. Other information

Remarks on MSDS

: The component(s), as mentioned in section 3, are registered in the Toxic Substances Control Act Inventory (USA).

Overview relevant R-sentences from all components in section 3 :

22

Harmful if swallowed.

34

Causes burns.

50/53

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

65

Harmful: may cause lung damage if swallowed.

Date last update

: 2004-12-23

* Point to alterations with regard to the previous version.

The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.

WORKPLACE INSTRUCTION CARD (14960)

Date last update:2004-12-23

Date of request:2007-09-27

IDENTIFICATION

Product code 12nc : 1303 500 42001
Supplier : DOW CORNING
Tradename : MOLYKOTE DX
General description : LUBRICATING PASTE
Appearance : paste - white - almost odourless

USAGELABEL (The supplier may give a different EC-label (Userlabel).)

* **R-phrases** : Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
* **S-phrases** : Avoid release to the environment. Refer to special instructions/Safety data sheets.
Hazardous components : not applicable

FIRST AID

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.

PRECAUTIONARY MEASURES



polyvinyl alcohol gloves



safety goggles

Skin : none (when used normally)
Local exhausting : Under normal circumstances not applicable.
Spillage procedure : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.
Emergency procedure : not applicable
Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray
Unsuitable fire-extinguisher : not traceable
Reaction with water : no

* Point to alterations with regard to the previous version.

The information provided in this Instructioncard is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.



PHILIPS

MATERIAL SAFETY DATA SHEET

According EC 1907/2006 (REACH)

1. Identification of the substance/preparation

MSDS : 24515
Product code 12nc : 1322 534 33801
Supplier : RHENUS LUB GMBH & CO KG
 Erkelenzer Str. 36
 D-41179 Mönchengladbach
 Germany
 TEL: + 49(0)2161-5869-0
 FAX: + 49(0)2161-5869-93
Tradename : RHENUS NORLITH STM 2
General description : BALL BEARING GREASE
Use : Various
Publicationdate : 2008-01-15
General information : dangerous.goods@philips.com
Emergency phonenumber : +31 (0)497-598315

2. Hazard identification

3. Composition/information on ingredients

Component	CAS-no	EC-no	Catalogue-no	Percentage(%)	EC-label
MINERAL OIL					
LITHIUM SOAP					
ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-	4259-15-8	224-235-5		<2.5	N;R: 51/53

4. First-aid measures

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray
Unsuitable fire-extinguisher : not traceable
Special fire-fighting equipment : In the event of fire, wear protective clothing and use breathing apparatus that is independent of the ambient air.
Hazardous decomposition products in fire : carbon monoxide, zinc oxide, sulphur oxides, phosphorus oxide, lithium oxide

6. Accidental release measures

Spillage procedure : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.
Emergency procedure : not applicable

7. Handling and storage

Local exhausting : Under normal circumstances not applicable.
Storage conditions : Store product protected from the sun, frost free.
Storage code (on behalf of PGS 15) : none

8. Exposure controls/personal protection

Exposure limits :
applicable to: The Netherlands (20 °C; 1013 mbar)
 TWA(8 hours): 5 mg/m3 MINERAL OIL(as oil aerosol) (Statutory threshold limit value)
 No TWA has been laid down. LITHIUM SOAP
 No TWA has been laid down. ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-
applicable to: Belgium (20 °C; 1013 mbar)
 TWA(8 hours): 5 mg/m3 MINERAL OIL(as oil aerosol)

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TWA(15 minutes): 10 mg/m3 MINERAL OIL(as oil aerosol)

applicable to: Germany (20 °C; 1013 mbar)
TWA(8 hours): 200 mg/m3 MINERAL OIL(carbonhydrogen mix, group 4)

applicable to: United States of America (25 °C; 1013 mbar)
TWA(8 hours): 0.2 mg/m3 MINERAL OIL(as mineral oil, inhalable dust)

C=Ceiling; S=Skin

Remarks exposure limits :

none

Odour threshold (20°C; 1013 mbar) :

not traceable

DNEL (Derived No Effect Level)

not traceable

PNEC (Predicted No Effect Concentration)

not traceable

Advised personal protection :

Hands : polyvinyl alcohol gloves
Eyes : safety goggles
Inhalation : none (when sufficient exhausting)
Skin : none (when used normally)

9. Physical and chemical properties

Physical state : paste
Colour : brown
Odour : specific
Vapor rate/range : not traceable
Boiling point/range : not traceable
Melting point/range : >180 °C
Flash point/range : >200 °C
Explosive limits : not traceable
Dust explosions possible in air : not applicable
Relative density : ≥0.88 - ≤0.92 (water=1) (20 °C)
Vapour pressure : not traceable
Solubility in water : none
Solubility in fat : not traceable
pH : not applicable
Viscosity : not traceable
Autoignition temperature : not traceable
Decomposition temperature : not traceable
Electrostatic chagement : no

10. Stability and reactivity

Conditions to avoid : none
Reactions with water : no
Hazardous reactions with : oxidizing substances
Hazardous decomposition products at heating : none

11. Toxicological information

Symptoms

Skin : local : The substance is prickling: redness.
: general : Probably no absorption worth mentioning.
Ingestion : local : The substance is prickling: sore throat.
: general : Probably no absorption worth mentioning.
Inhalation : local : The substance is with atomising prickling: sore throat.
: general : Probably no absorption worth mentioning.
Eyes : local : The substance is prickling: redness.
Remarks symptoms : None

Toxicity :

LD-50: 3.1 g/kg (ORL-RAT), ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-

Method : OECD 401

Source : IUCLID

LD-50: >5.0 g/kg (SKN-RBT), ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-

Method : OECD 402

Source : IUCLID

Ames test : negative ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-

Source : Supplier

12. Ecotoxicological information

Biological oxygen demand (5) : not traceable
Chemical oxygen demand : not traceable
Biological/chemical oxygen demand ratio : not traceable

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Degradability	: degradable ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-	Source	: Supplier
Biochemical factor	: not traceable		
Log Po/w	: 2.86 ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-	Source	: IUCLID
Henry Constant	: 0.0111 atm m ³ /mol ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-	Source	: Easi View

Ecotoxicity :			
LC-50: >1 - ≤5 mg/l/96H (Fish), ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-	Method	: OECD 203	
	Source	: IUCLID	
EC-50: >1 - ≤1.5 mg/l/48H (Daphnia), ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-	Method	: OECD 202	
	Source	: IUCLID	
IC-50: >1 - ≤5 mg/l/96H (Algae), ETHYLHEXYL ZINC DITHIOPHOSPHATE, 2-	Method	: OECD 201	
	Source	: IUCLID	

Remarks on ecotoxicity : none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation.

14. Transport information

Not subject to Transport-regulation Dangerous Substances

15. Regulatory information

EC-Label	: not applicable
Remarks on EC-labeling	: none

16. Other information

Remarks on MSDS : none

Overview relevant R-sentences from all components in section 3 :
51/53 Toxic to the aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Date last update : 2008-01-15

* Point to alterations with regard to the previous version.
The information provided in this Material Safety Data Sheet is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.

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WORKPLACE INSTRUCTION CARD (24515)

Date last update:2008-01-15
Date of request:2008-08-18

IDENTIFICATION

Product code 12nc : 1322 534 33801
Supplier : RHENUS LUB GMBH & CO KG
Tradename : RHENUS NORLITH STM 2
General description : BALL BEARING GREASE
Appearance : paste - brown - specific

USAGELABEL

not applicable

FIRST AID

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.

PRECAUTIONARY MEASURES



polyvinyl alcohol gloves



safety goggles

Skin : none (when used normally)
Local exhausting : Under normal circumstances not applicable.
Spillage procedure : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.
Emergency procedure : not applicable
Fire-extinguisher : carbon dioxide, extinguishing powder, foam, water spray
Unsuitable fire-extinguisher : not traceable
Reaction with water : no

* Point to alterations with regard to the previous version.
The information provided in this Instructioncard is correct to the best of the knowledge, information and belief of Philips Electronics Nederland B.V. at the date of its printing.



PHILIPS

MATERIAL SAFETY DATA SHEET

According EC 1907/2006 (REACH)

1. Identification of the substance/preparation

MSDS : 10137
Product code 12nc : 1322 524 42501
Supplier : NSK
Tradename : NSK GREASE NO.2
General description : GREASE
Use : Various
Publicationdate :
General information : dangerous.goods@philips.com
Emergency phonenumber : +31 (0)497-598315

2. Hazard identification

3. Composition/information on ingredients

Component	CAS-no	EC-no	Catalogue-no	Percentage(%)	EC-label
DISTILLATES (PETROLEUM), SOLVENT-REFINED	64741-88-4	265-090-8	649-454-00-7	≥23.0 - ≤25.0	Xn;R: 65
HEAVY PARAFFINIC (DMSO <3%)					
ETHYLHEXYL-SEBACATE, BIS(2-	122-62-3	204-558-8		≥53.0 - ≤59.0	
LITHIUM STEARATE	4485-12-5	224-772-5		≥17.0 - ≤19.0	
METHYLENEBIS[N-SEC-BUTYLANILINE], 4,4'-	5285-60-9	226-122-6		≥1.0 - ≤3.0	

4. First-aid measures

Skin : Remove residue substance as soon as possible from the skin (f.i. rinse with much water).
Ingestion : Let drink 1 or 2 glasses of water. In case of general disorders call for a doctor.
Inhalation : Not applicable.
Eyes : Rinse for a long time with much water. In case of eye-sight disturbances consult a doctor.
Remarks first aid : none

5. Fire fighting measures

Fire-extinguisher : carbon dioxide, extinguishing powder, water spray, alcohol resistant foam
Unsuitable fire-extinguisher : not traceable
Special fire-fighting equipment : In the event of fire, wear protective clothing and use breathing apparatus that is independent of the ambient air.
Hazardous decomposition products in fire : carbon monoxide, nitrous oxides, lithium oxide

6. Accidental release measures

Spillage procedure : Dependent on quantity spilt paste, one has the choice between: - remove with cleaning rag or paper, or - cover paste with Powersorb, sand, diatomite, vermiculite and suchlike. Shovel the material into plastic bag or other suitable packaging and remove to the central depot for hazardous waste.
Emergency procedure : not applicable

7. Handling and storage

Local exhausting : Under normal circumstances not applicable.
Storage conditions : Store product away from ignition sources.
Storage code (on behalf of PGS 15) : none

8. Exposure controls/personal protection

Exposure limits :

applicable to: The Netherlands (20 °C; 1013 mbar)
TWA(8 hours): 5 mg/m3

No TWA has been laid down.
No TWA has been laid down.
No TWA has been laid down.

DISTILLATES (PETROLEUM),
SOLVENT-REFINED HEAVY PARAFFINIC
(DMSO <3%)(as oil aerosol) (Statutory threshold limit value)
ETHYLHEXYL-SEBACATE, BIS(2-
LITHIUM STEARATE
METHYLENEBIS[N-SEC-BUTYLANILINE],
4,4'-

applicable to: Belgium (20 °C; 1013 mbar)
TWA(8 hours): 5 mg/m3

DISTILLATES (PETROLEUM),
SOLVENT-REFINED HEAVY PARAFFINIC
(DMSO <3%)(as oil aerosol)

Date of request : 2007-11-06

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TWA(15 minutes): 10 mg/m3

DISTILLATES (PETROLEUM),
SOLVENT-REFINED HEAVY PARAFFINIC
(DMSO <3%)(as oil aerosol)**applicable to:** Germany (20 °C; 1013 mbar)

TWA(8 hours): 1000 mg/m3

DISTILLATES (PETROLEUM),
SOLVENT-REFINED HEAVY PARAFFINIC
(DMSO <3%)(carbonhydrogen mix, group
1)**applicable to:** United States of America (25 °C; 1013 mbar)

TWA(8 hours): 0.2 mg/m3

DISTILLATES (PETROLEUM),
SOLVENT-REFINED HEAVY PARAFFINIC
(DMSO <3%)(as mineral oil, inhalable dust)

C=Ceiling; S=Skin

Remarks exposure limits :

none

Odour threshold (20°C; 1013 mbar) :

not traceable

DNEL (Derived No Effect Level)

not traceable

PNEC (Predicted No Effect Concentration)

not traceable

Advised personal protection :

Hands	:	butyl rubber gloves
Eyes	:	safety goggles
Inhalation	:	none (when sufficient exhausting)
Skin	:	none (when used normally)

9. Physical and chemical properties

Physical state	:	paste
Colour	:	white
Odour	:	almost odourless
Vapor rate/range	:	not traceable
Boiling point/range	:	not traceable
Melting point/range	:	not traceable
Flash point/range	:	200 °C
Explosive limits	:	not traceable
Dust explosions possible in air	:	not applicable
Relative density	:	0.93000 (water=1) (20 °C)
Vapour pressure	:	not traceable
Solubility in water	:	none
Solubility in fat	:	not traceable
pH	:	not applicable
Viscosity	:	not traceable
Autoignition temperature	:	not traceable
Decomposition temperature	:	not traceable
Electrostatic charge	:	no

10. Stability and reactivity

Conditions to avoid	:	none
Reactions with water	:	no
Hazardous reactions with	:	oxidizing substances, strong acids
Hazardous decomposition products at heating	:	none

11. Toxicological information**Symptoms**

Skin	* local	:	The substance is prickling: redness.	
	* general	:	Probably no absorption worth mentioning.	
Ingestion	* local	:	The substance is prickling: sore throat.	
	* general	:	The substance may be absorbed after ingestion.	
Inhalation	* local	:	The substance is with atomising prickling: sore throat.	
	* general	:	The substance may be absorbed after inhalation.	
Eyes	local	:	The substance is prickling: redness.	
* Remarks symptoms			:	The substance has an effect on: the kidneys, the nervous system, the heart.

Toxicity :

LD-50: >2.0 g/kg (ORL-RAT), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)

Source : CONCAWE

LD-50: >2.0 g/kg (SKN-RBT), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)

Source : CONCAWE

LD-50: 12.8 g/kg (ORL-RAT), ETHYLHEXYL-SEBACATE, BIS(2-

LD-50: 15 g/kg (ORL-RAT), LITHIUM STEARATE

Ames test : not traceable

Date of request : 2007-11-06

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12. Ecotoxicological information

Biological oxygen demand (5)	: not traceable		
Chemical oxygen demand	: not traceable		
Biological/chemical oxygen demand ratio	: not traceable		
Degradability	: degradable DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source	: CONCAWE
Biochemical factor	: not traceable		
Log Po/w	: ≥3.9 - ≤6 DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)	Source	: IUCLID
Henry Constant	: not traceable		

Ecotoxicity :			
LC-50: >1000 mg/l/96H (Fish), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)		Source	: CONCAWE
EC-50: >1000 mg/l/48H (Daphnia), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)		Source	: CONCAWE
IC-50: >1000 mg/l/72H (Algae), DISTILLATES (PETROLEUM), SOLVENT-REFINED HEAVY PARAFFINIC (DMSO <3%)		Source	: CONCAWE

Remarks on ecotoxicity : none

13. Disposal considerations

Remainder material or uncleaned empty packagings have to be incinerated in a proper installation or dumped on an approved landfill, in accordance with local and national legislation.

14. Transport information

Not subject to Transport-regulation Dangerous Substances

15. Regulatory information

EC-Label	: not applicable
Remarks on EC-labeling	: none

16. Other information

Remarks on MSDS : The component(s), as mentioned in section 3, are registered in the Toxic Substances Control Act Inventory (USA).

Overview relevant R-sentences from all components in section 3 :
65 Harmful: may cause lung damage if swallowed.

Date last update : 2007-03-01

* Point to alterations with regard to the previous version.
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CHAPTER A3 System configuration

The machine consists of separate modules, e.g. base, placement heads, trolleys etc. Every module is equipped with specific identification information that can be found in the appropriate parts of this service manual.

Depending on the preference of the customer or local service organization, part of this information can be used as a system identification.

A3.1 Machine identification

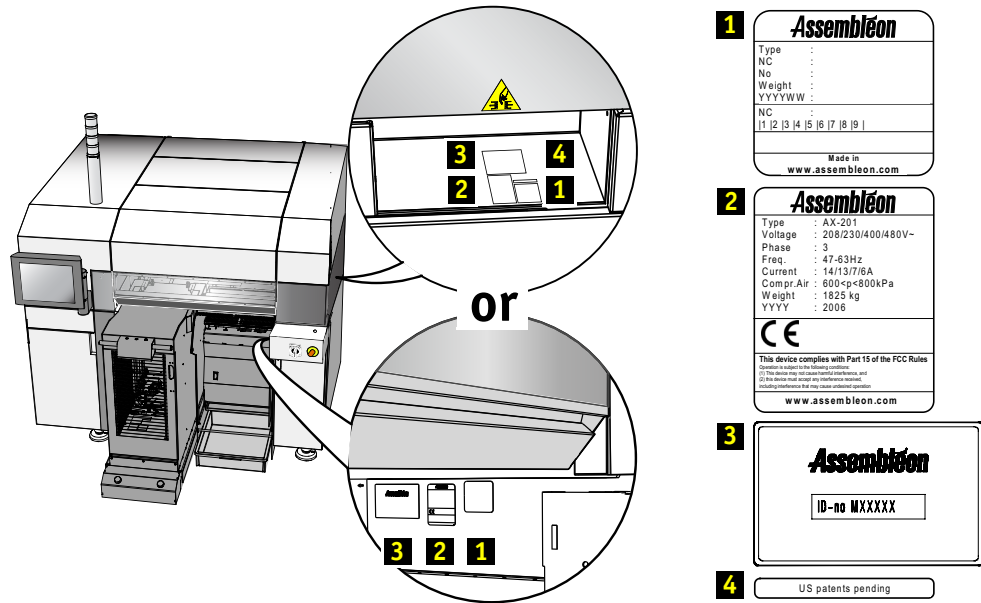


Figure 10 Machine identification

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number. 6 digit DC-number.
3	Service identification	5 digit M-number.
4	Patents pending sticker	-

Figure 11 Machine identification

A3.1.1 Machine history

PA	DC	Format
2410/00	000600-000XXX	First batch (with transformer as standard)
2410/01	000XXX-	Machine without transformer and start button. Machine can be equipped with transformer PA 1124/10.

Figure 12 Machine history

A3.2 Specifications

A3.2.1 Machine dimensions and weight including trolleys

Sizes with trolleys, lamp post and touch screen(s)

(Sizes in millimetres)

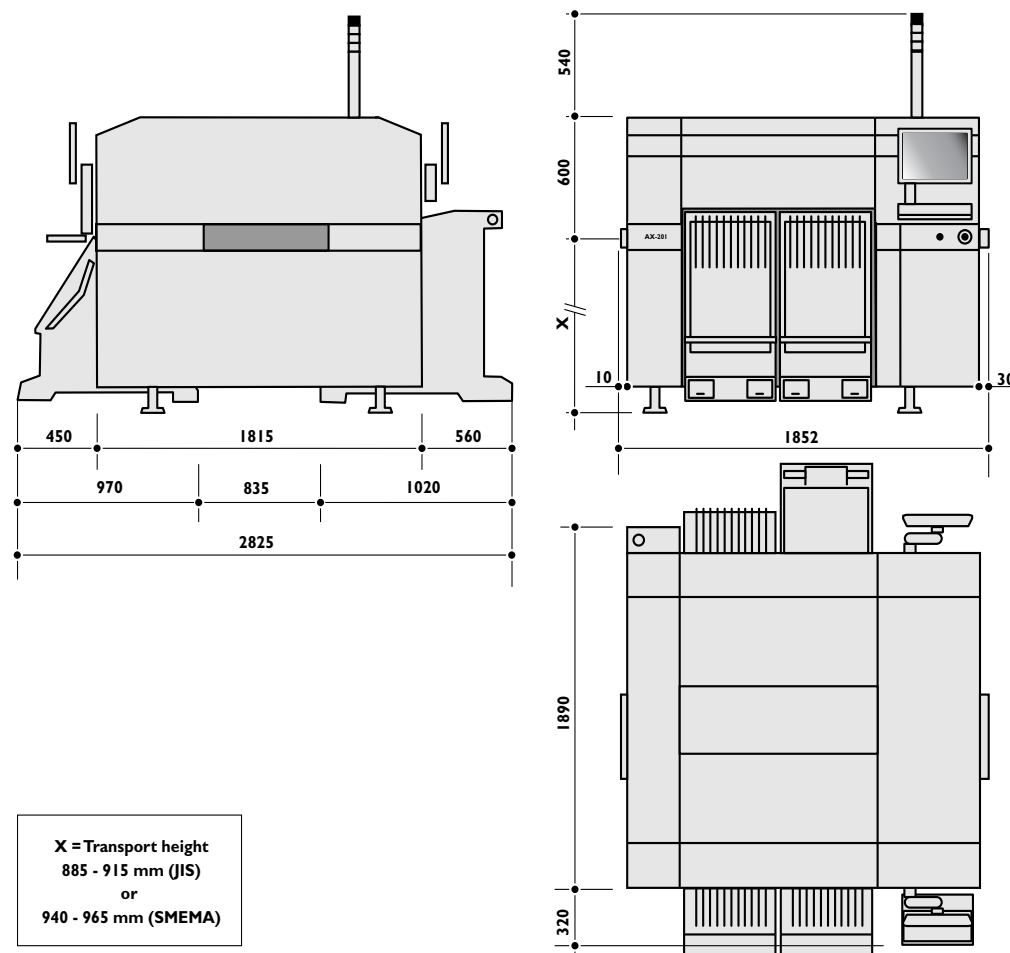


Figure 13 Machine dimensions

Machine	Weight
AX-201	2750 kg

Figure 14 Machine weights

A3.3 Configuration overview

The AX-201 is a modular system, build up of several commercially available units or purchase account numbers (PA-numbers).

These PA- numbers can be found in the following table.

PA number	Name	Remark
PA 1124/10	A-Series transformer	Fits on AX-201 PA 2410/01
PA 1290/00	Reject module	Including vacuum calibration pad
PA 1862/10	Component vision LFOV	
PA 1863/10	Component vision SFOV	
PA 2090/21	SVS Pro loading unit EUR/APR	Including scanner
PA 2090/26	SVS Pro loading unit USA	Including scanner
PA 2090/34	SVS Pro trolley upgrade ACM/AQ/D9	
PA 2090/56	SVS PRO AX-201 EUR/APR	Contains all modules needed to equip AX-201 with SVS pro {1* Base upgrade, 4 (2)* Trolley upgrade, 1 * SVS Pro controller, scanner}
PA 2090/58	SVS-PRO AX-201 USA	Contains all modules needed to equip AX-201 with SVS pro {1* Base upgrade, 4 (2)* Trolley upgrade, 1 * SVS Pro controller, scanner}
PA 2280/x9	PPS Pro 8.4	
PA 2284/xx	AX-201 Optimizer/Balancer	
PA 2410/00	AX-201 Basic System	
PA 2415/00	Placement Head Dual Vision	Assy including a.o. BA camera, 4x z-phi actuator
PA 2415/50	Placement Head High Accuracy (PH-HA)	Including BA camera and 2x z-phi actuator
PA 2420/00	AX-201 CSW Release 1.0	
PA 2425/00	Board transport	
PA 2430/00	Safety Cover Single Feed	
PA 2431/00	AX-201 Sector Safety Cover	Based on AX SSC, but covering larger robot reach
PA 2435/00	Installation Tooling	With "AX calibration nozzle"
PA 2440/00	Maintenance kit	
PA 2445/00	BTCO Key	
PA 2445/10	MIS Key	
PA 2445/20	Multilanguage Key	
PA 2450/00	TEU AX-201	Combined TEU for AX,AQ toolbits
PA 2455/00	Second User Interface	When having trolley lifts at the rear side
PA 2601/01	ITF II Tape Loading Unit	
PA 2602/00	ITF II Feeder Storage Cart	
PA 2632/00	A-series Feeder Trolley	Without tape cutter
PA 2636/05	A-series Feeder Bank	
PA 2654/00-60	Intelligent Tape Feeders 8-56mm	
PA 2657/00	Twin Tape Feeder	
PA 2673/10	A-series Trolley Lift	
PA 2674/10	Tray Carrier	

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PA number	Name	Remark
PA 2681/00	A-series Tray Trolley	
PA 2744/10..40	Nozzles O1-O4	
PA 2746/10	Nozzle V1, PH DV (4 x)	V1 nozzle for PH-DV with rubber tip (as O1)
PA 2746/20	Nozzle V2, PH DV (4x)	V2 nozzle for PH-DV with rubber tip (as O2)
PA 2749/20..50	Nozzles TE	O3 till O5 nozzles and I10 nozzle
PA 2749/6x	Nozzles Odds	S1 till S3 nozzles
PA 2751/30	Odd SMD Gripper	
PA 2752/00..30	Nozzles Flip Chip	FC1 till FC4 nozzles
PA 2771/35	AX nozzle L8	
PA 2771/55	Nozzle V9, PHDV	Like V3 but with rubber tip
PA 2832/00	Verification Set	
PA 2908/11	Tape Splicing Tool	
PA 3010/10	Traceability interface	
PA 3020/10	Performance monitor	
PA 3030/10	Parts library manager	
PA 3440/10	Documentation English	
PA 3440/11-21	Language Options AX-201	

Figure 15 Configuration components

A3.3.1 Machine configuration

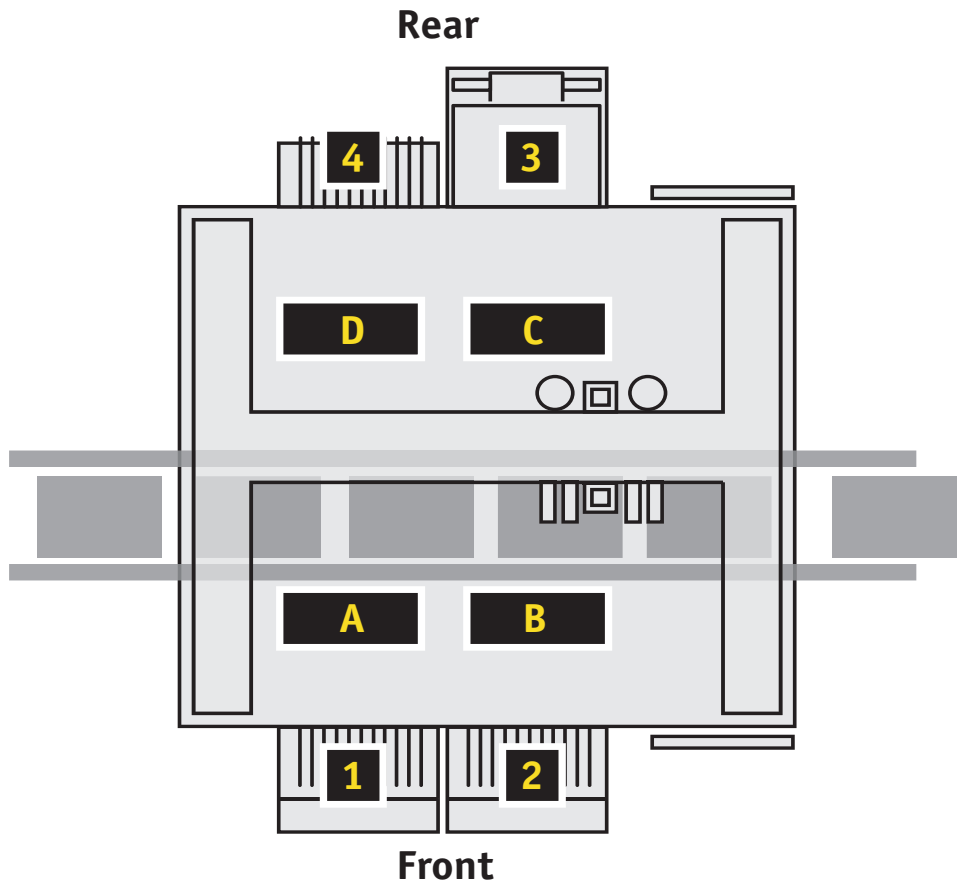


Figure 16 Machine configuration

Part	Location
Trolleys, feeder bank	1,2,3,4
Reuse station	A
CV camera	B,C
Toolbit exchange unit	D

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A3.3.2 Machine assembly tree

Location of position A,B,C and D see [Figure 16](#)

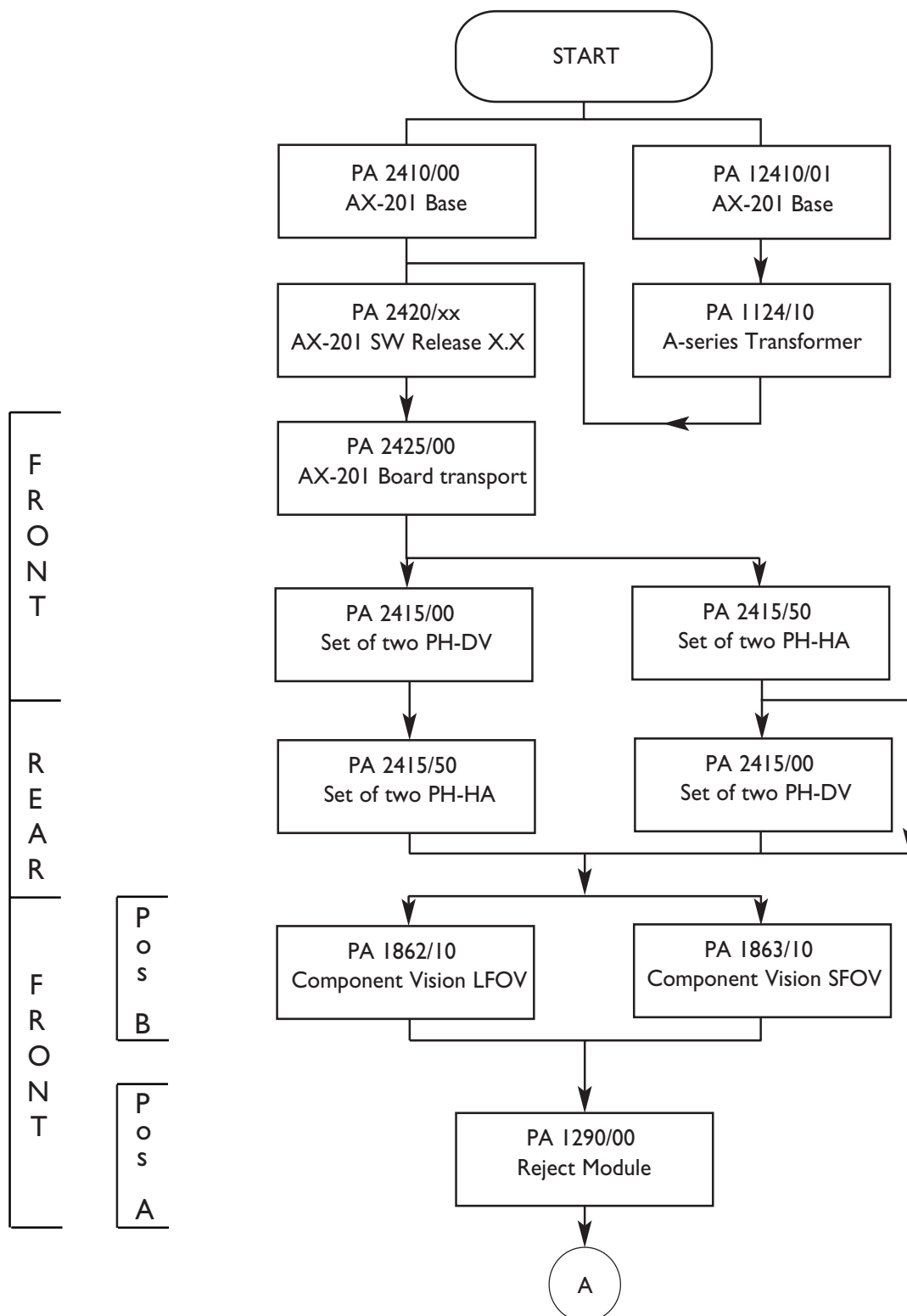


Figure 17 Machine assembly tree 1

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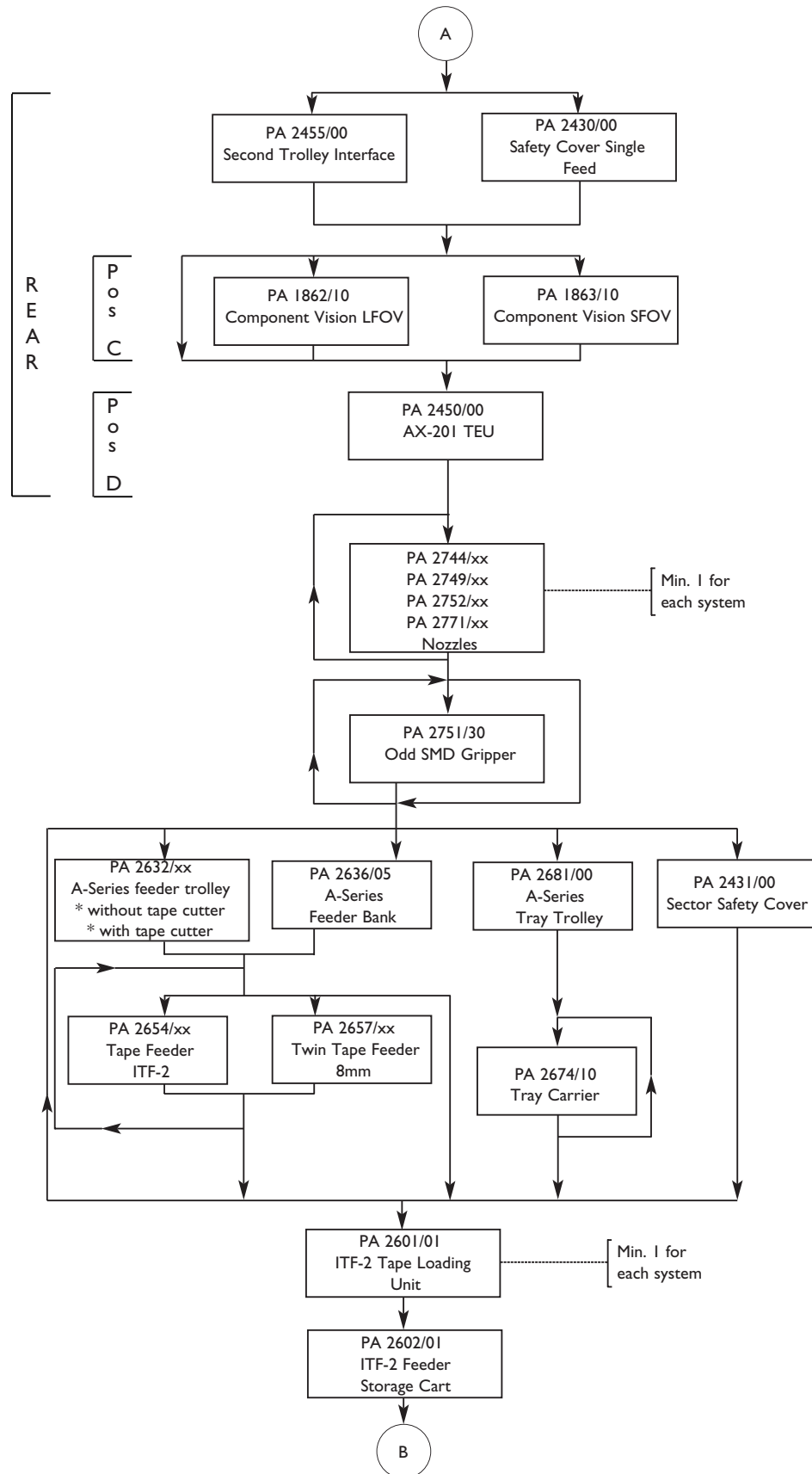
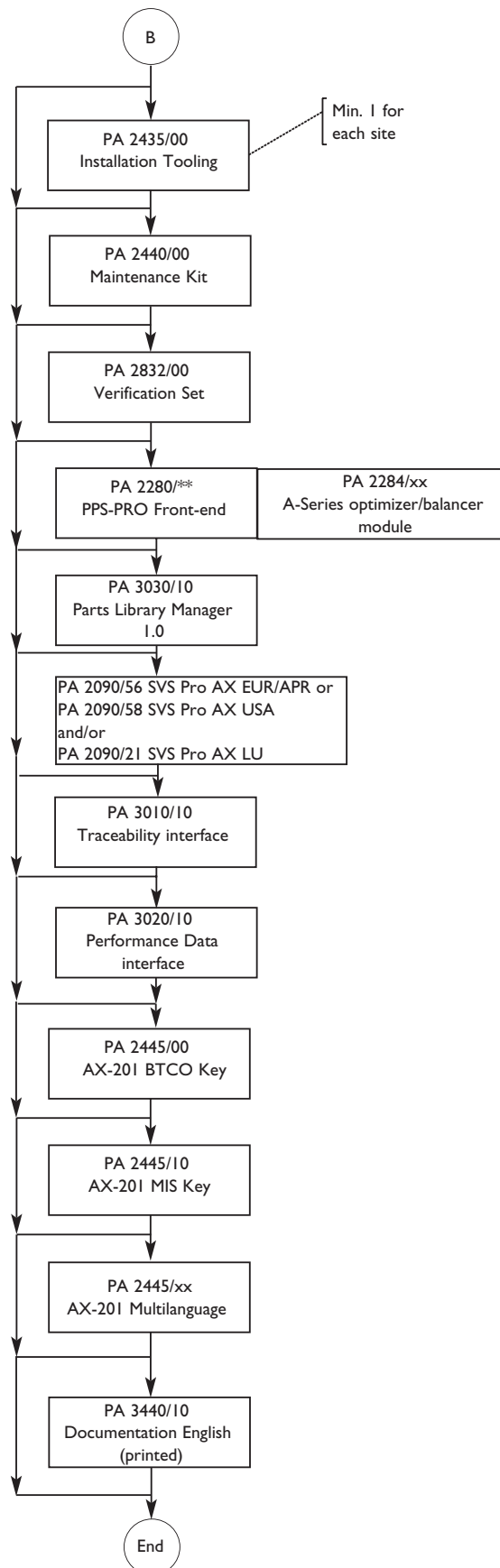


Figure 18 Machine assembly tree 2

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Figure 19 Machine assembly tree 3

CHAPTER A4 System description

A4.1 Introduction

This chapter clarifies the design and function of the machine in general.

Explained are basics such as the coordinate system, board alignment principles etc.

Furthermore the function of the modules and how they cooperate is explained.

In this chapter the several modules are considered as 'black boxes'. For information about how they work, maintaining, repairing etc. see the specific tab.

Because of its modular build up, it is important to identify your configuration. This to know which part of the manual is applicable.



NOTE: Refer to [A3.3 Configuration overview](#) , for determining a system configuration.

A4.2 Machine breakdown

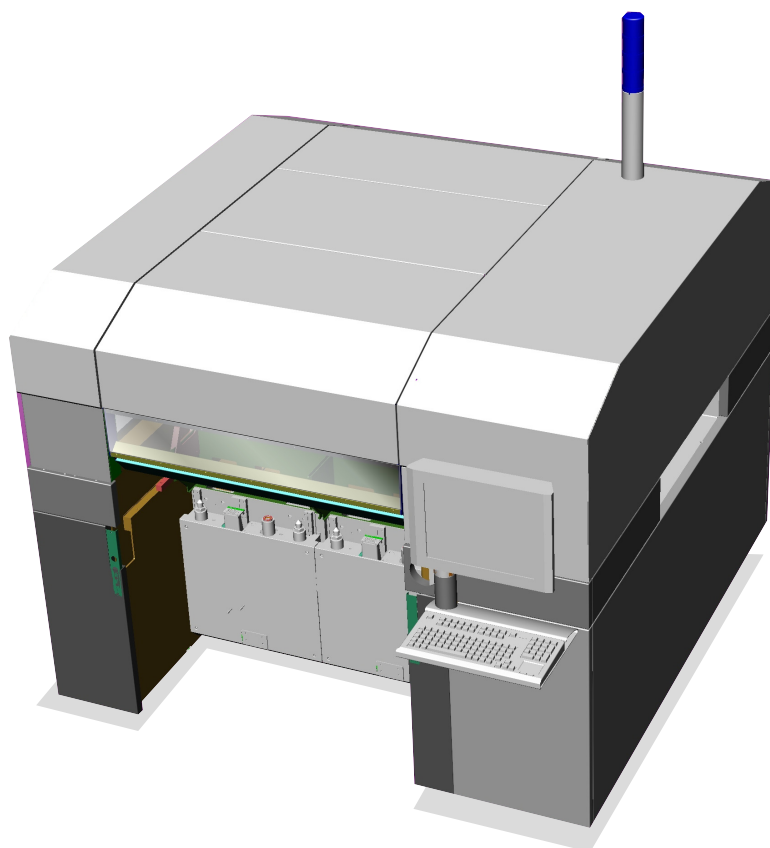


Figure 20 Main machine modules

The main parts of the machine are as follows:

	Designation	More detailed designation
1	Base	A4.3.1 Base
2	Board transport	A4.3.2 Board Transport
3	Pick and place	A4.3.3 Pick and place
4	Trolleys	A4.3.4 Trolleys and covers
5	Vision	A4.3.5 Vision
6	XY robot	A4.3.6 XY robot
7	Fluxer	-

Figure 21 Main machine modules

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A4.3 Main parts, outlines

In this paragraph an outline of the main parts will be given.
More technical details can be found in the concerning tabs.

A4.3.1 Base

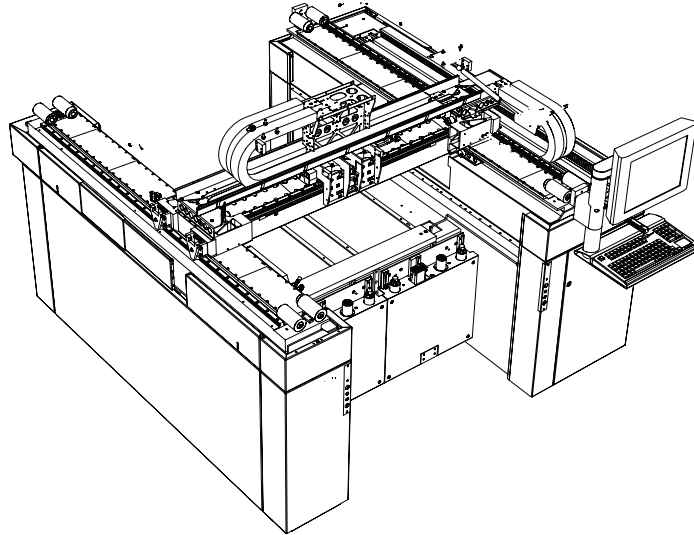


Figure 22 Base

The base is the backbone of the machine and offers accommodation for controllers, electronics, wiring etc. The board transport, XY robot, trolley lift are mounted on the base. All electrical and moving components are safely placed behind protection covers.

A4.3.2 Board Transport

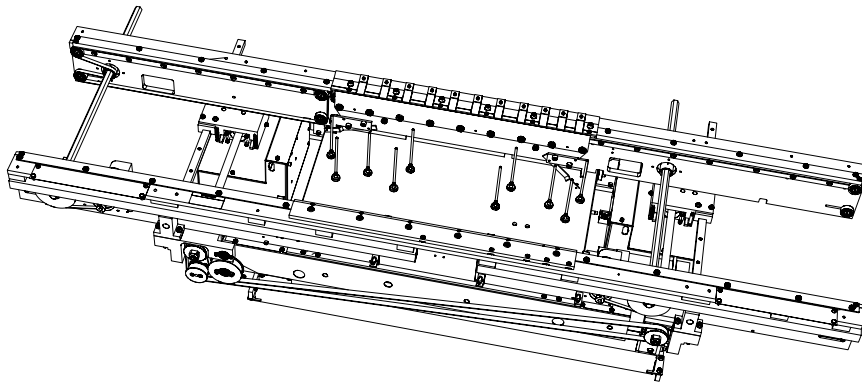


Figure 23 Board transport

The function of board transport is transporting boards through the machine, controlled by the transport controller. Board identification is supported. The board transport is a belt driven, front rail fixed, transport device for boards. It is divided into two sections; run-in and work-area. The transport direction is normally unidirectional (left to right) and the width is set automatically.

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A4.3.3 Pick and place

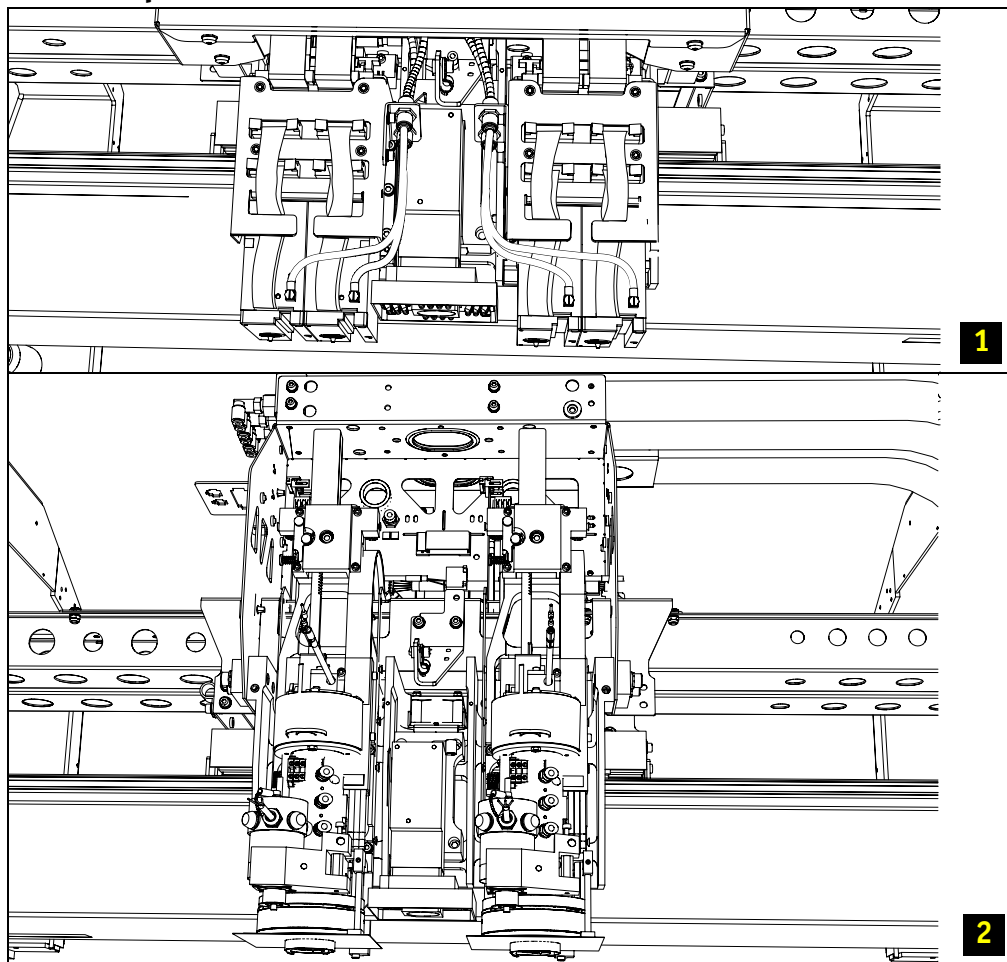


Figure 24 Placement heads

The function of the placement heads is picking components from feeders or trays, and placing them on boards. Each placement head is equipped with individual Z-height, RZ, impact and real-time force control.

The placement heads are controlled by the placement head controllers.

The maximum number of placement heads on a machine is 6.

There are two types of placement heads:

1. Placement heads DV (1)
Component size up to 21 x 21 x 12 mm.
2. Placement heads HA (2)
Component size up to 45 x 45 x 46 mm.

A4.3.4 Trolleys and covers

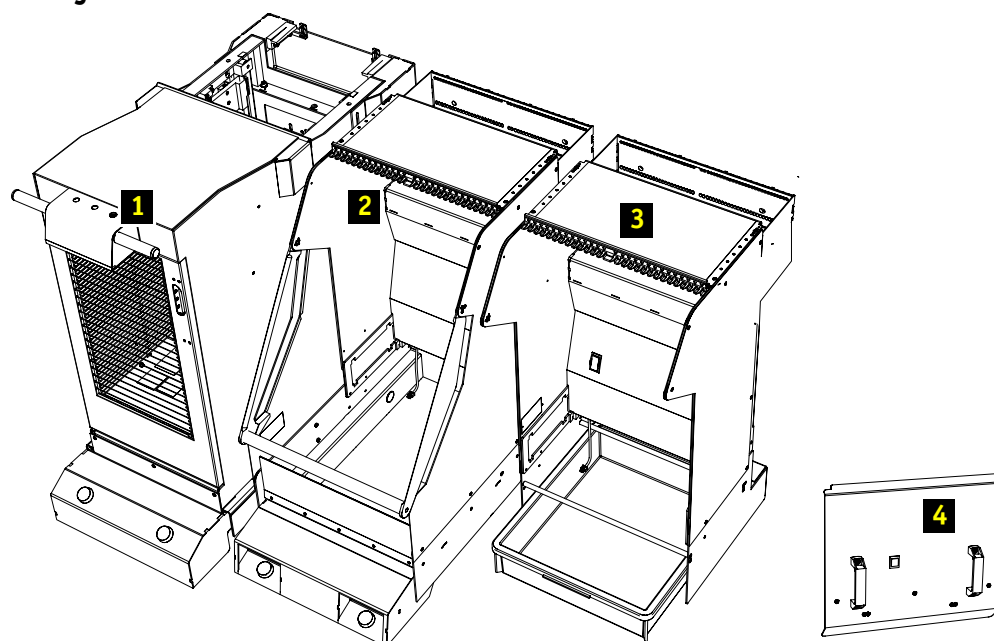


Figure 25 Trolleys and feeder banks

1. Tray trolley

The tray trolley is connected to the machine by the trolley lift during production. Power and signals are provided to the tray trolley via the electrical interface on the trolley lift. A tray trolley can hold up to 48 trays.

The tray trolley is operated by foot switches. The tray trolley can hold multiple carriers. A carrier contains one or two trays that are selected or de-selected by the tray trolley controller.

2. Feeder trolley

The feeder trolley is connected to the machine by the trolley lift during production. Power and signals are provided to the feeder trolley via the electrical interface on the trolley lift. A feeder trolley can hold up to 48 feeders of various types. The feeder trolley is operated by foot switches.

3. Feeder bank

In most cases the feeder bank is permanently connected to the machine. Power and signals are provided to the feeder trolley via the electrical interface on the trolley lift. A feeder bank can hold up to 48 feeders of various types.

The feeder bank is operated by a switch.

4. Safety cover

If no trolley or bank is provided, a safety cover must be mounted instead.

The safety cover is operated by a switch.

Several type of feeders can be mounted on a feeder bank or trolley. The feeder and/or tray trolley can be exchanged including the feeders/trays that it contains.

A4.3.5 Vision

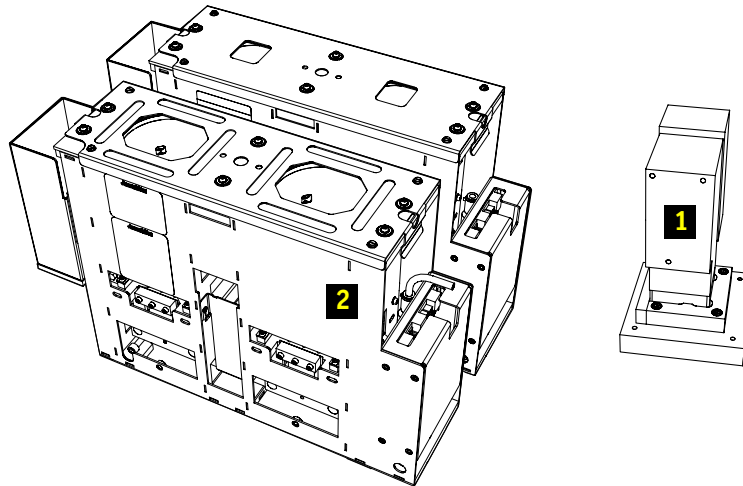


Figure 26

The vision system comprises BA (board alignment) (1) and component vision (2). Fiducials are used to improve the placement accuracy of the components on the boards. Their measured position is used to correct for the X, Y, and phi inaccuracy of the circuit pattern on the board, and for board stretch. Component vision is used to determine how a component is positioned with respect to its placement head. This information is incorporated in the position where the head is lowered for placement. Vision processes the image of the components, gives a signal to the process controller that the placement head is allowed to move to the placement position and, while the placement head is moving to the placement position, continues to process the images.

A4.3.6 XY robot

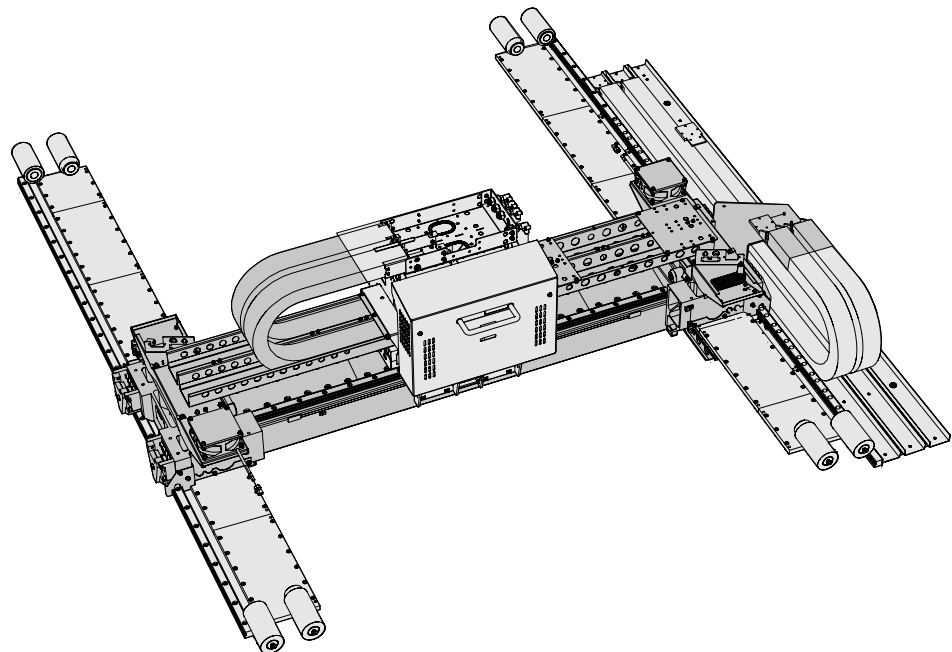


Figure 27 XY robot

The XY robot consists of 3 axes, 2 for movements in Y direction and one for movements in X direction. Each axis is controlled by an amplifier. The amplifiers are controlled by an XY controller card placed in the process controller

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The X axis has an interface which can carry a maximum of six placement heads and two board alignment (BA) cameras.

A4.3.7 Additional modules

A4.3.7.1 Setup verification system pro (SVS Pro)

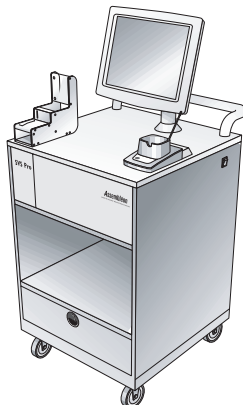


Figure 28 Setup verification system pro (SVS Pro)

The machine supports setup verification. The setup verification system pro (SVS Pro) aids the operator in:

- Setting up the feeder trolleys, feeder and component configuration off-line on the SVS Pro loading unit.
- Maintaining a correct setup during production (SVS Pro will not allow production to start with incorrect setup and guides the replenishment of almost empty feeders).
- Lot traceability using barcode identification of the reels to keep track of the selected components.

For more information refer to the SVS Pro option manual.

A4.3.7.2 Traceability

Traceability is a tool to collect all production data. If necessary, you can use this to recall incorrect boards. The incorrect boards can be found with the traceability-data, using a front-end or by searching the files.

Traceability is available in two products (in different of detail):

1. Board traceability

Board traceability combines SVS Pro and board identification into one, traceable dataset per board. That dataset contains information about the machine used to build the board, the identifier of the board (e.g. barcode), and the components used (ex. part number, vendor number, and lot number).

2. Batch traceability

Batch traceability combines SVS Pro and board identification into one, traceable dataset per batch. That dataset contains information about the machine used to build the boards, all identifier of the boards in the batch, and the components used (ex. part number, vendor number, and lot number) in the batch.

A4.3.7.3 Hardware keys

Some options are available via a software licence. All licences are encrypted in a hardware key. This is a 25-pin parallel port connector, connected to the system controller.



Figure 29 Hardware key used for software licences

Option
Software licence Barcode triggered change over (BTCO KEY)
Software licence (MIS KEY)
Software licence Multi language (MULTILANGUAGE KEY)

Figure 30 Software licenses, overview

See [A6.3 Software licences, adjusting](#) for using these keys.

A4.4 Architecture

A4.4.1 Co-ordinate system

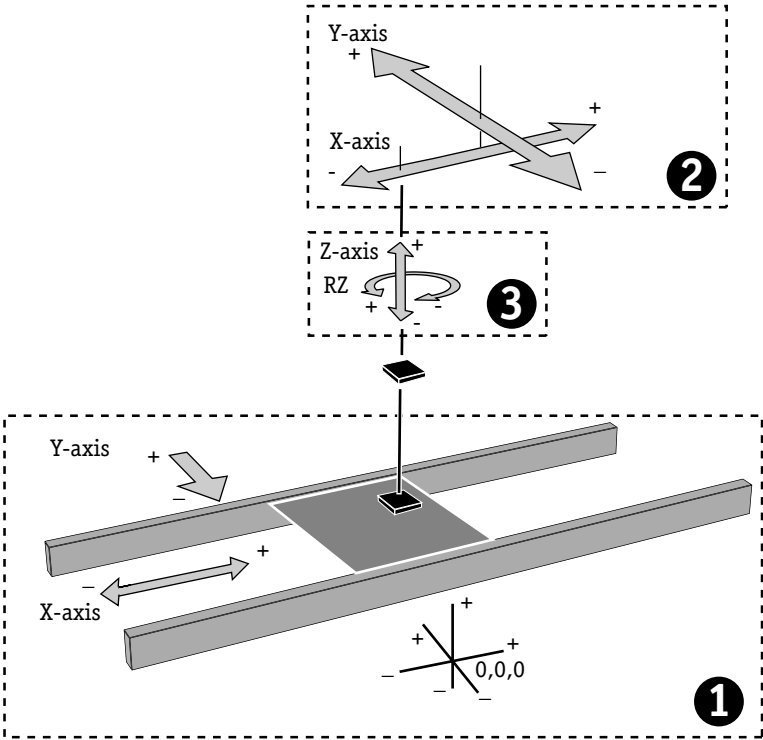


Figure 31 Definition of co-ordinate system

No.	Directions	Corresponding module	Function:
1	X axis	Transport	Moves board in X direction
	Y axis		Board width adjustment of transport
2	X axis	XY Robot	Moves placement head in X direction
	Y axis		Moves placement head in Y direction
3	Z axis	Placement head	Component picking and placing
	RZ		Rotating the component

Figure 32 Transport and placement head directions

■ Accuracy

Accuracy is the deviation at the lead-tip of a placed, ideal component with respect to fiducials on an ideal glass test board. Included are all offset- and incidental errors in the XY plane and all errors in the XY plane (observed at the lead tip) due to rotational errors.

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A4.4.2 Power and Safety, survey

A4.4.2.1 Power circuits

The incoming power to the machine that ranges between 200 and 480 Volts AC (50 - 60 Hertz) is converted by the mains supply unit to the internal voltage levels, necessary for the system:

- 24 V DC dual vision and placement heads HA, board transport, auxiliary feeding, vision and XY robot.
- 44 V DC dual vision and placement heads HA, board transport, auxiliary feeding.
- 230 V AC (single phase) for process controller, system controller, trolley lifts, etc.
- 400 V AC (3 phase) for the XY robot.

More detailed information on power circuits and power distribution can be found in the description of the base (B) , board transport (C) and pick & place module (D).

A4.4.2.2 Safety circuits

■ Safety circuit, description

The safety circuit's main purpose is to ensure a safe state of the machine under all operating conditions. Depending on the state of several safety detection devices, motion control of moving machine parts is disabled or enabled.

The safety circuit consists of two separate circuits:

A. Safety sensing circuit

B. Servo power activation circuit.

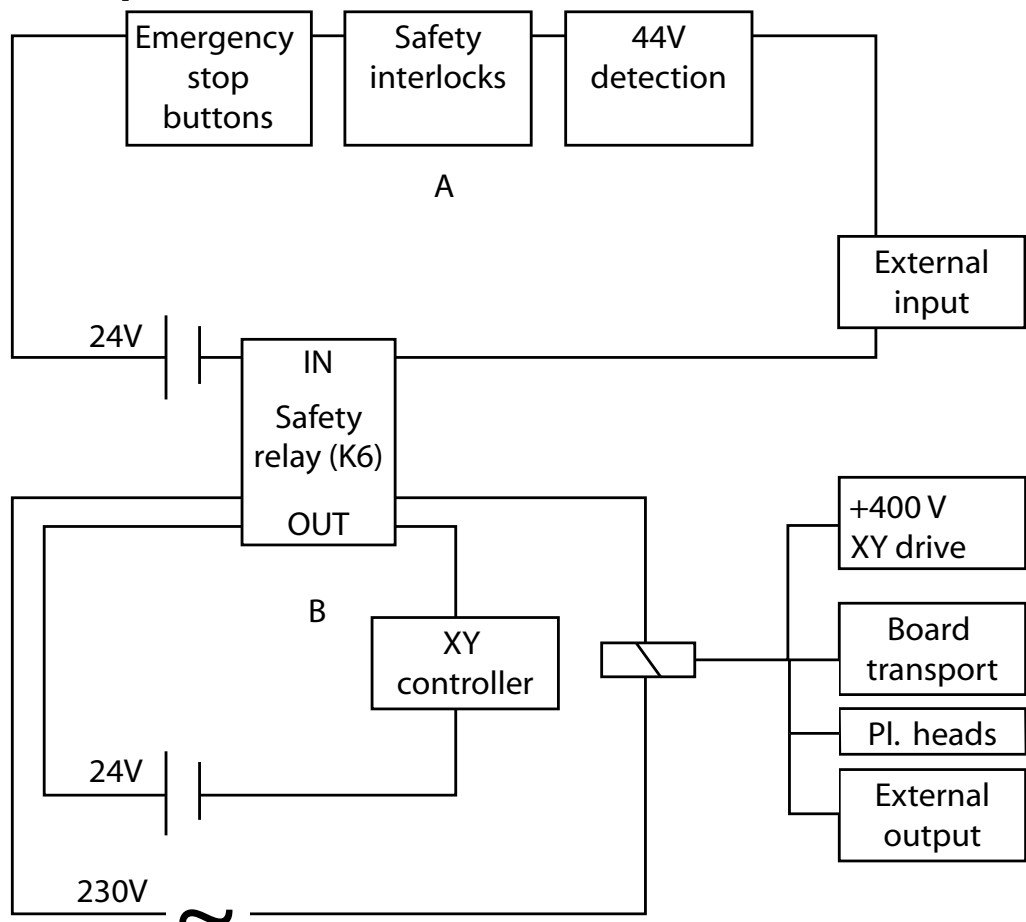


Figure 33 Simplified overview of safety circuit

- The safety sensing circuit consists of 24 V loop through the machine that can be interrupted by one of the emergency stop buttons or one of the safety interlocks. A closed sensing circuit enables the safety relay (K6) to switch.
- The servo power activation circuit provides power to the servo power relays located in the control supply unit. The safety relay switches 24 V to the motion controllers. The servo power relays enable power supply to the servo motors.

■ Safety circuit, components

The safety circuit sensing part contains several safety detection devices. All of these devices influence directly the safety relay of the mains supply.

Safety detection device	Detected unsafe situation
Phase guard relay (on machines with transformer).	Incoming 3 phase power supply not OK
Safety interlock on the front cover.	Front cover open
Safety interlock on the rear cover.	Rear cover open
Safety interlock on each trolley lift.	Trolley lift not in upper position
Emergency stop buttons (2x)	Emergency stop button pressed
External safety circuit connection.	External safety circuit interrupted
Thermal sensor in mains transformer.	Temperature of mains transformer too high
44 Volts input check	Machine damage

Figure 34 Safety circuit, schematic

A4.4.3 Data communication

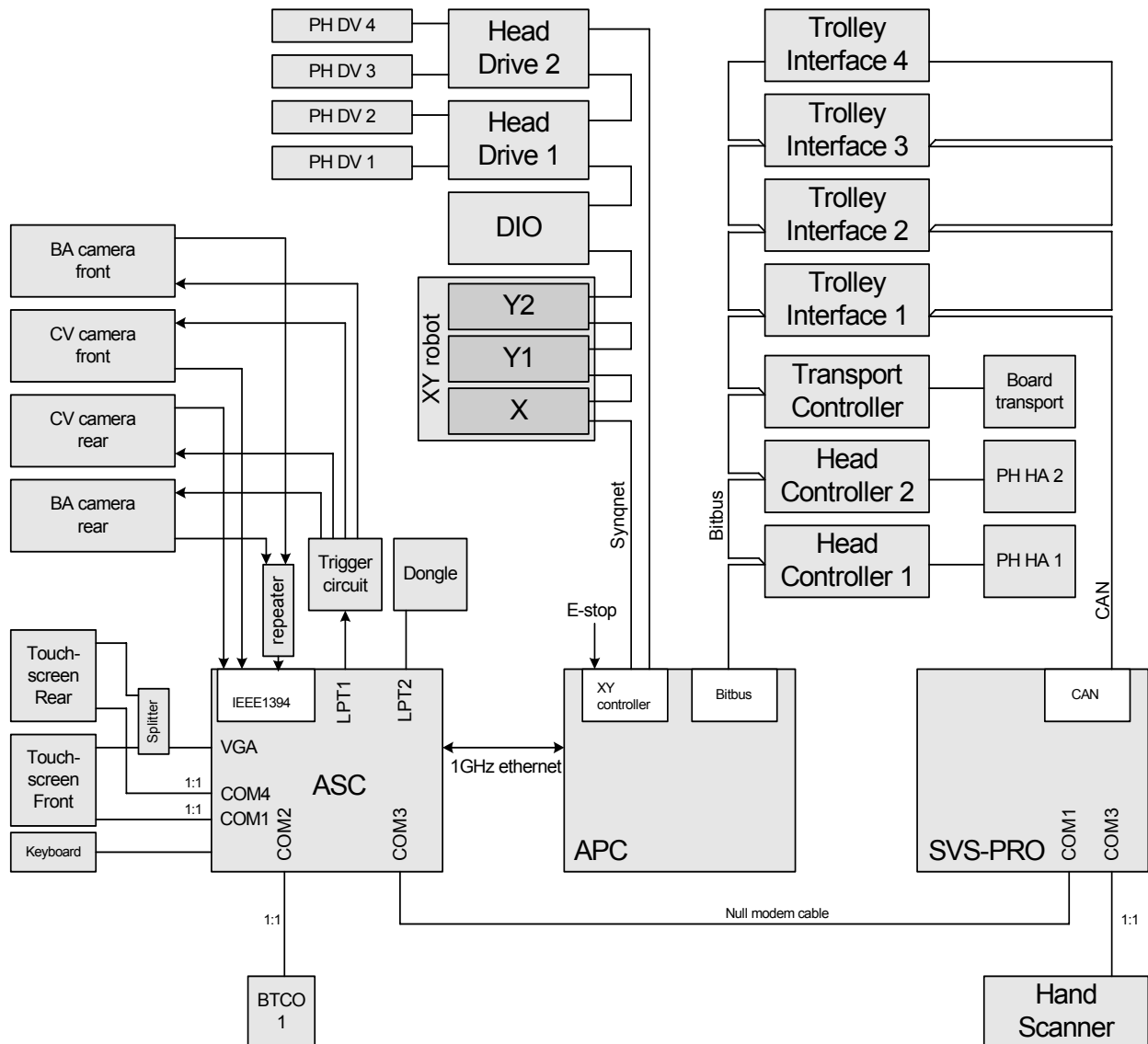


Figure 35 Data communication

A4.4.3.1 Synqnet communication

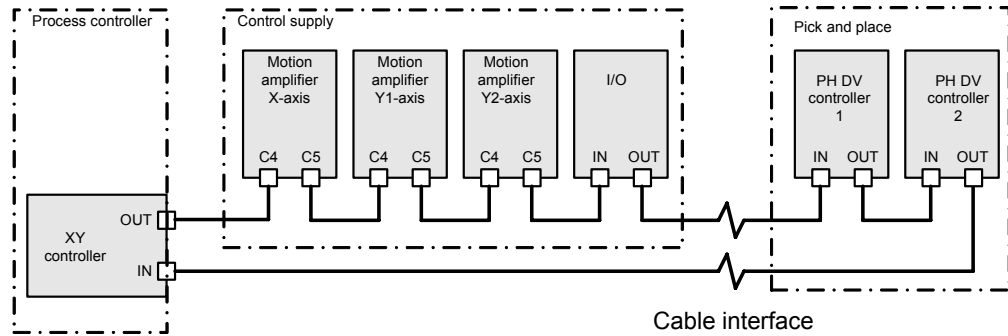


Figure 36 Synqnet communication

A4.4.3.2 Bitbus communication

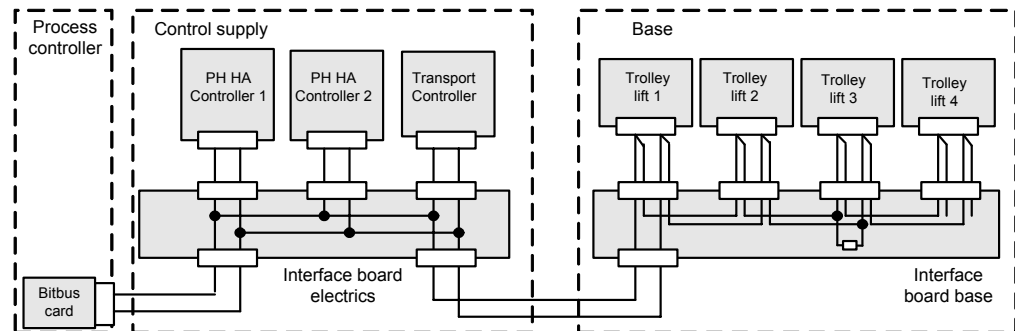


Figure 37 Bitbus communication

A4.4.3.3 CAN communication

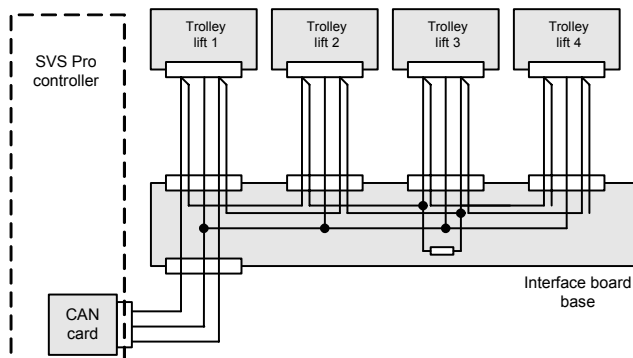


Figure 38 CAN communication

CAN communication is only applicable if the machine is equipped with SVS-Pro.

A4.4.3.4 Firewire communication

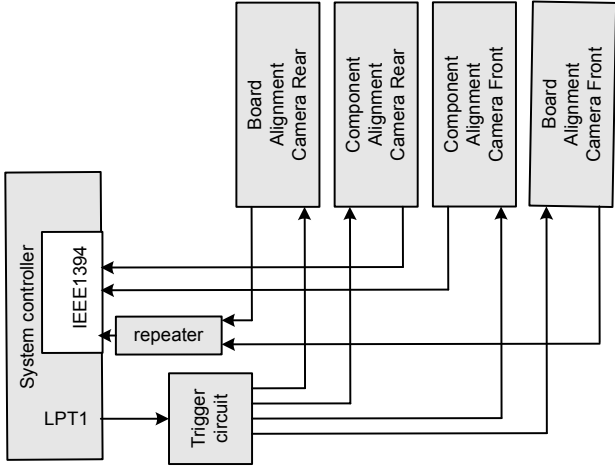


Figure 39 Firewire communication

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A4.5 System principles and processes

A4.5.1 Servo systems

A4.5.1.1 Servo system principle

In general, a servo system contains an electric **motor** which moves an object. The position of the object is tracked by an **encoder**, which is coupled to the motor axis. A **control system** receives the encoder information and accordingly sends signals to an amplifier which drives the motor (see Figure 40).

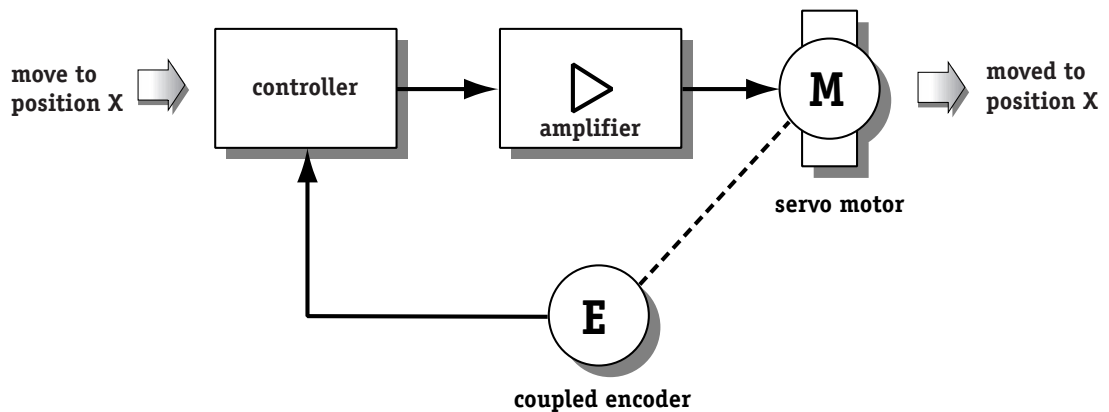


Figure 40 General principle of a servo system

The servo motor's encoder can be a **rotary** encoder or a **linear-scale** encoder. In most applications, rotary encoders are used.

A4.5.1.2 Rotary encoder principle

This encoder consists of a disk with a large number of position markers, an index marker and three sensors (see Figure 41).

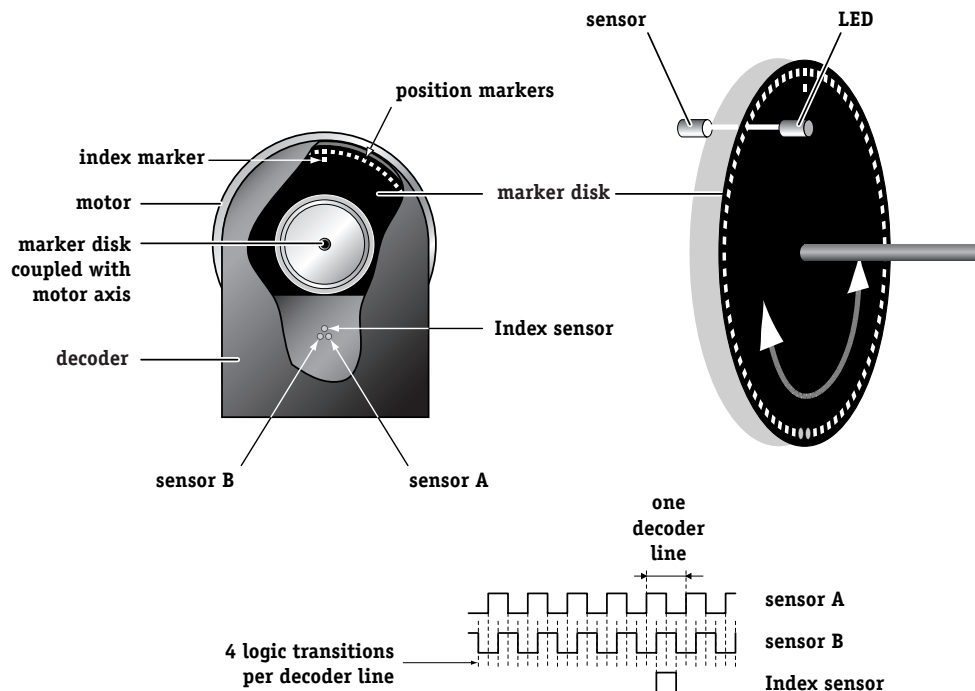


Figure 41 Principle of a rotary encoder

As this encoder uses a light source and photo detectors, it's called an optical encoder. It generates an output signal as the encoder disk rotates. The disk passes between a light source and photo detectors. The number of position markers ("light windows") on the disk determines the number of on-off cycles of each output during a revolution. The detectors are arranged such that the two output signals (from sensor A and sensor B) are shifted in phase 90°. With these two signals the system is able to determine direction. A once-per-revolution index signal is provided for establishing a home or zero position upon power up.

The electronic circuitry in the decoder counts the pulses from the encoder to determine the position of the motor. A homing action is required once to determine the starting position from which each new position can be determined counting the 'increments' (pulses) along. The two 90° phase-shifted signals allow the decoder to count up when rotating in one direction and down in the other, thus always remembering the absolute position of the system as long as power is applied. There are four logic transitions per cycle, which provide four times the resolution over the number of position markers.

Determining the number of pulses per time unit gives information about the velocity of the motor. This enables the system to regulate velocity but also acceleration and deceleration.

A4.5.1.3 Linear encoder principle

Linear encoders are present in the XY robot. These encoders are scales that contain precise slits (grating) and in the centre of the scale a 'zero-pulse'. Pulses are generated by an optical reader runs near the glass ruler.

The homing action determines the end of the work area position and runs to the centre zero pulse. Herewith positions in the work area are determined.

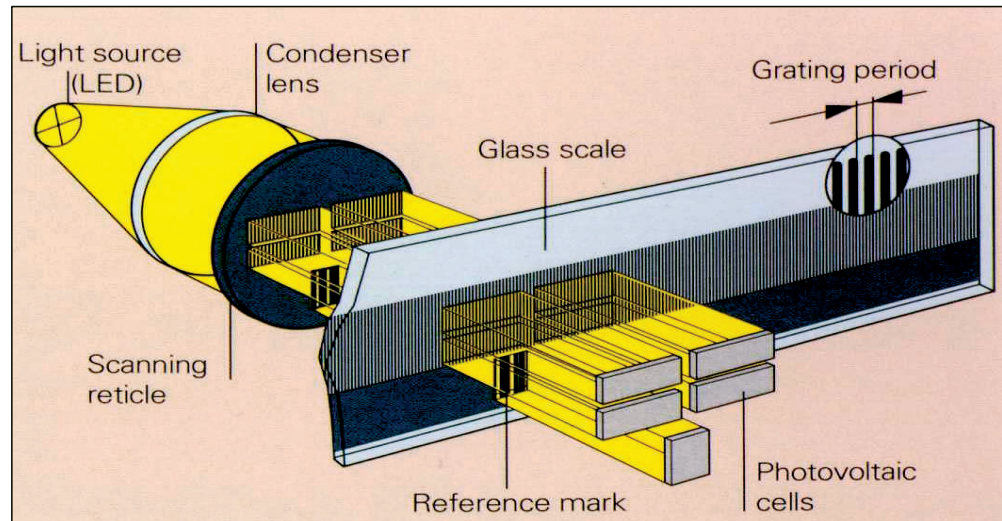


Figure 42 Example of the linear-encoder principle

A4.5.2 SMEMA

SMEMA stands for Surface Mount Equipment Manufacturers Association.

This is a standardized link between SMD-handling machines that are placed together in one production line.

The AX-201 complies with these SMEMA standards:

■ SMEMA-connection

The SMEMA, SMEMA X1 and SMEMA X2 connectors are located on the board transport. The SMEMA-I/O is handled by the transport controller.

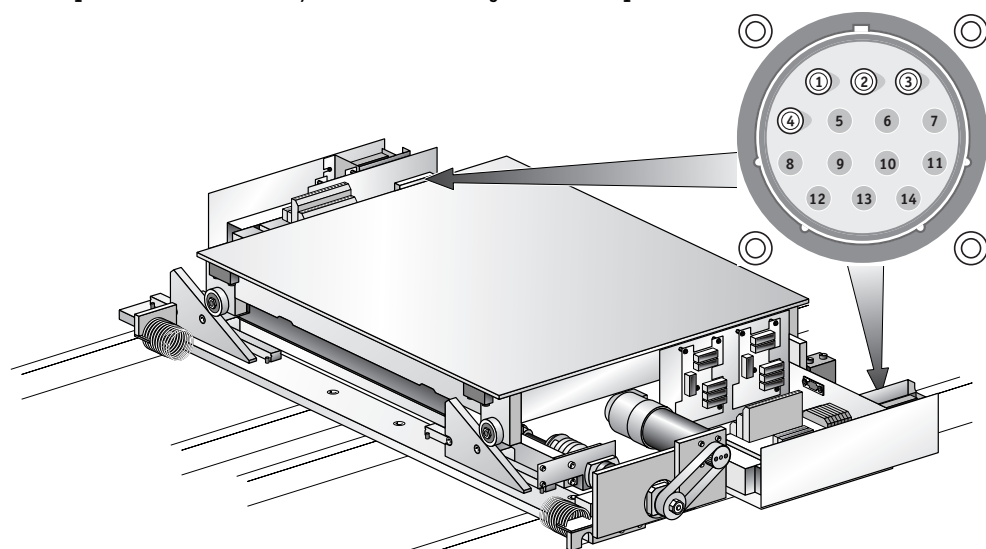


Figure 43 SMEMA connectors on board transport

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A4.5.3 Board markers

A4.5.3.1 Fiducials

The machine makes use of vision to recognize fiducials and artwork on a board. Fiducials and artwork are used to define the exact location of a board in relation to the machine coordinate system. This information is used for accurate component placement.

Fiducials are dedicated markers of a pre-defined shape.

Each board contains a number of fiducials. These are artwork markers of which shapes and nominal positions are defined in the placement program.

These fiducials are read by the BA camera, and the results are sent to the placement controller.

From the *should be*-data (from the placement program) and the *as is*-data (as measured by the BA camera), the placement controller calculates an offset (X,Y), rotation (RZ) and possibly stretch/shrink of the artwork. The placement controller uses this to enhance accuracy by calculating the corrected placement coordinates to be sent to the robot.

A4.5.3.2 Acceptance criteria for fiducials

The fiducial detection and localization process can be divided in five steps. Rejection of the fiducial can occur in each of these steps for reasons specific to that step.

The detection process consists of the following steps:

Step	Board	Criterion	Remarks
Find the best illumination setting for the fiducial at the nominal location.	First board of a batch.	- Sufficient contrast	The illumination setting found here will be used for the next boards.
Find the shape of the fiducial (Only when there is no Gerber-file data available).	First board of a batch.	- Supported shape (see below). - Fiducial at the correct position. - Sufficient contrast for consistent edge detection. - Fiducial sufficiently separated from surrounding features. - More than 80% of the edge was detected.	The shape found here will be used for the next boards.
Find the fiducial on it's nominal location \pm approx. 2 mm.	Every board.	- Fiducial is at its nominal location. - Contamination on the board.	
Find the size \pm 0.1 mm and the center of the fiducial.	Every board.	- Measurement is stable (Repeated measurements give equal results).	
Match the fiducial to other fiducials on the board.	Every board.	- Center of the fiducial is at its nominal location in relation to previously measured fiducial(s) on the same board.	

Figure 44

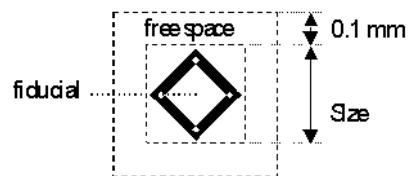
The detection algorithm looks for the edges of the fiducial. This has important implications for the detection process. A fiducial with rough or jagged edges stands a greater change of rejection, even if the surface dimensions appear to be correct.

Summarizing, the fiducial must have the following properties to be accepted by the machine:

- The fiducial shape must be according to the AX-201 specification:



- The fiducial must show sufficient contrast in relation to its background. The machine sets the illumination mode for optimal contrast. Fiducials should in all cases have optical contrast (>30%) with the board (light fiducial on dark board or dark fiducial on light board).
- The fiducial must be less than approximately 2 mm in X and 2 mm in Y from its nominal location.
- The fiducial must be at least 0.1 mm from the neighboring features.
For the size counts: $0.3 \text{ mm} \leq \text{fiducial size} \leq 3.0 \text{ mm}$.



- The fiducial must be at the correct distance from other fiducials on the board. The correct distance is calculated from the data in the placement program.
- In Local Artwork Recognition a maximum of 2048 fiducials can be defined.

A4.5.3.3 Artwork

Artwork is a part of the board design and can be via's, pads, traces etc.
During normal operation these vision measurements are running on the background and are not visible for an operator. In case of trouble shooting a vision interface is available to manipulate and test vision data

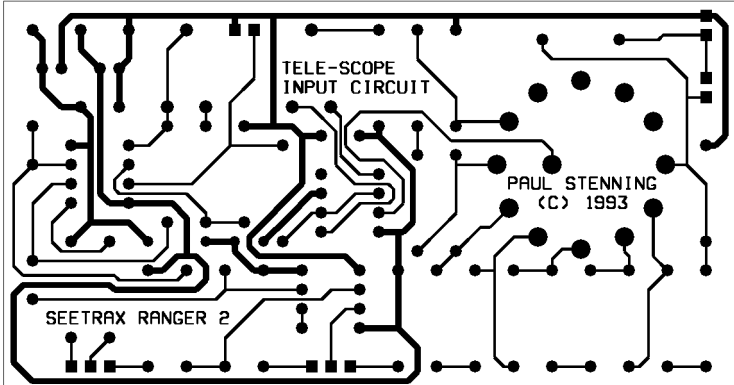


Figure 45 Artwork example

As board reference also pieces of artwork can be defined. These artwork pieces must have enough free space clearance (> 0.1 mm).

A4.5.3.4 Badmarks

Badmarks (a) are used to inhibit the placement of components on particular circuits on a board. For instance, badmarks can be put on particular circuits by an operator when these circuits are considered to be of bad quality. In this way, waste of (expensive) components is prevented.

The following badmarks can be recognized:

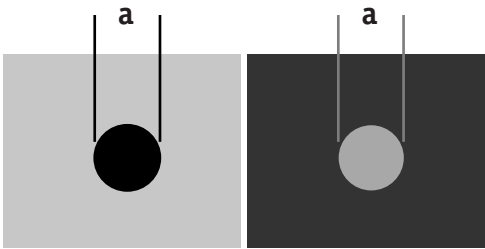


Figure 46 Badmarks, examples

Badmarks (a)	Value
Type	Black or white sticker, of fiducial type, > Ø 1 mm, < Ø 3 mm
Contrast	Black marks to be dark on light background or white marks to be on a dark background.
Max. number of badmarks	≤ 2048

Figure 47 Badmark definition

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A4.6 Software

A4.6.1 Software description

A4.6.1.1 Operating software

The operating software for the system controller and process controller is Windows XP. Installing operating software, see [B8.3 Operating software, installation](#)

A4.6.1.2 Multi language licence

The application software supports multi language: all GUI screens, errors and helptexts.

The multi language functionality has to be enabled by a software licence.

For general information about software licences [A4.3.7.3 Hardware keys](#) .

A4.6.2 Machine control

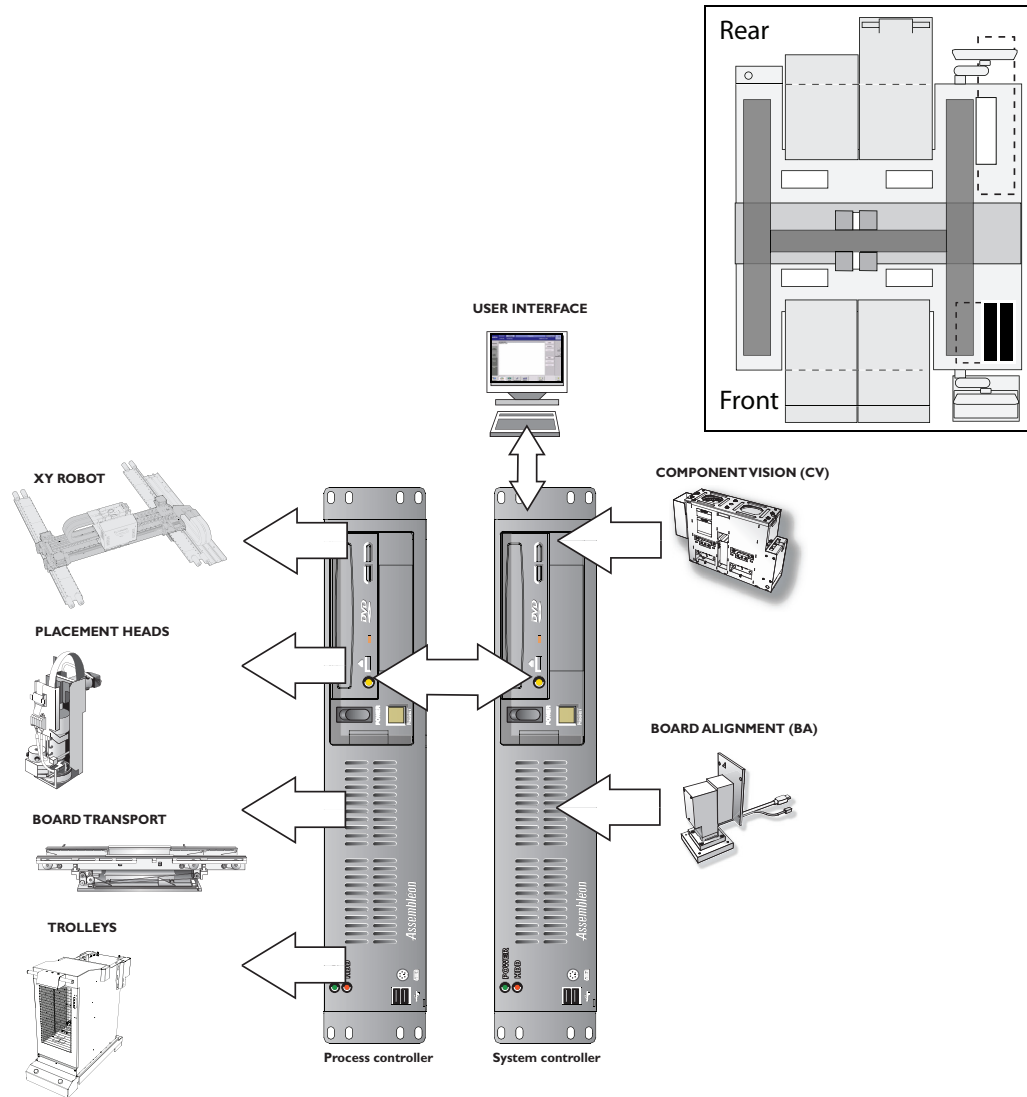


Figure 48 Control system architecture

A4.6.2.1 System controller

The system controller coordinates the activities within the machine. It interacts with the process controller on a per board basis. The process controller executes the placement process. The system controller monitors the boards in the machine and initiates a change-over when required, this is based on orders entered by the operator or by process controller.

The system controller monitors the current machine set-up and checks it against the required set-up (as indicated in the data from PPS).

The main tasks of the system controller are:

- Providing a user interface.
- Interfacing with SVS Pro controller.
- Interfacing with production control system.
- Managing data sets:
 - Machine set-up.
 - Manufacturing performance data (basic and extended MIS).

- Maintenance data.
- Calibration data.
- Vision files.
- Placement programs.
- Accuracy verification.
- Managing orders.
- Identifying boards that enter the machine.
- Perform (automated) change-overs.
- Validate machine set-up.
- Control synchronisation between board transport and placement (once per board).
- Provide assistance in error recovery.
- Provide maintenance and service functions.
- Support system calibration procedures.
- Support of off-line machine documentation.

A4.6.2.2 Process controller

The Process controller executes the placement program. It operates independently from the system controller during the placement on one board.

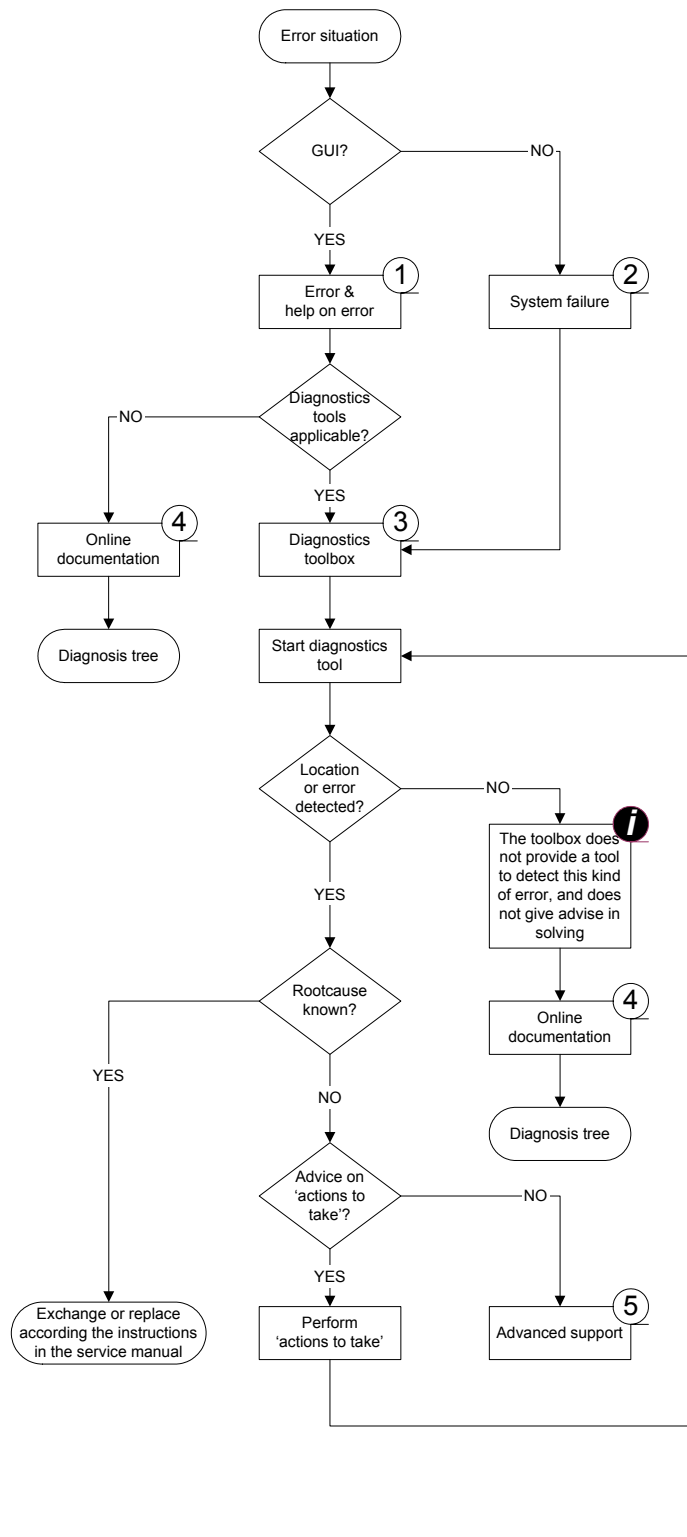
When the board is complete, interactions with the system controller take place. When an error situation occurs that cannot be handled autonomously, the process controller requests assistance from the system controller. The process controller also functions as gateway for some functions on the feeder controllers (e.g. related to component verification) and the transport controller.

The process controller is responsible for:

- Execution of the placement process on a per board basis.
- Providing automatic error recovery strategies.
- Coordinate the synchronisation between various controllers.
- Coordinate the synchronisation between the XY robot axes.
- Short term on-line calibration of the machine.
- Control hardware through subordinate controllers.

CHAPTER A5 System troubleshooting

A5.1 Troubleshooting work flow



Reference:

- 1.A5.1.1 Error and help on error ,
- A5.1.8 Machine status check
- 2.A5.1.2 System failure dialogue
- 3.A5.1.3 TIP tools
- A5.1.4 Bitbus communication check
- A5.1.6 Hardware maintenance & service tool, overview
- A5.1.7 Vision hardware test tool
- 4.A5.1.9 Documentation
- 5.A5.1.10 Advanced support

FIGURE 49 Error information flow

A5.1.1 Error and help on error

The graphical user interface of the application software gives error- and help texts. The information in the help text guides the user through the most likely error causes and advised actions to solve the error situation. When the troubleshoot process reaches the point where defective hardware is a possible error cause, the user is guided towards the diagnostics toolbox when applicable. Using the toolbox, hardware failures can be diagnosed further. If no tools are applicable, the user is guided towards the extensive troubleshoot information in the service manual. Manuals are available on-line via the help menu.

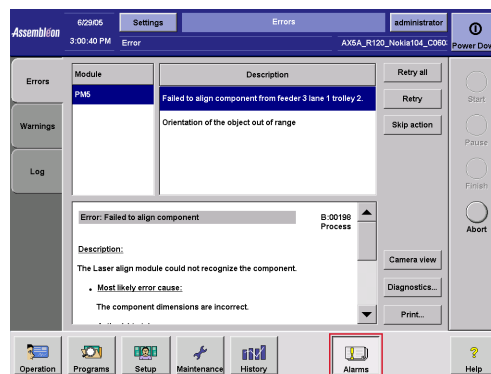


FIGURE 50 Error and help information screen with access to diagnostics toolbox

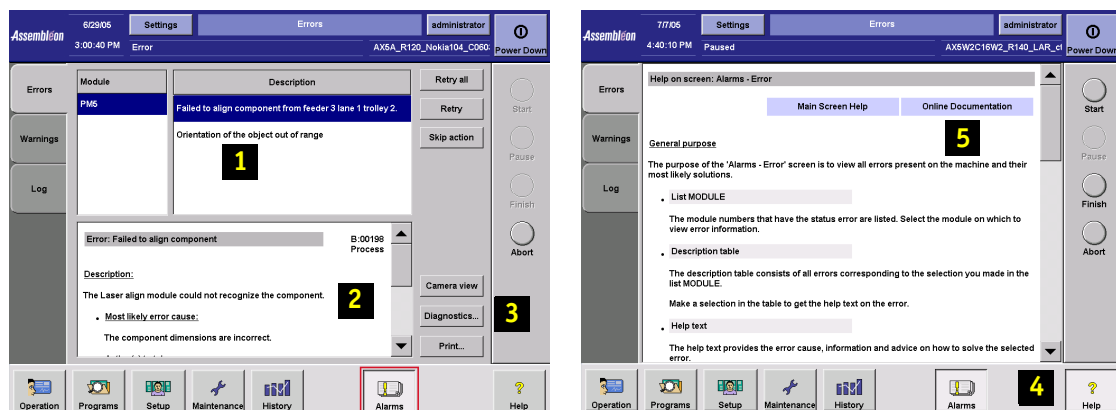


FIGURE 51 Error and help information screens.

Context sensitive error texts (1) and help texts (2) are provided with all errors. The help texts are meant to be read in order:

- c) Utilities monitor errors.
- d) Process errors (transport, pick and place, setup verification, data, program, system calibration).
- e) Machine errors (motion, laser, vision, general).

REMARK: The help texts are also represented in the 'Online Help Archive', present on the AX-201 documentation CD, for reference.

When the help text refers to the diagnostics toolbox, selecting the 'diagnostics' button (3) switches to the toolbox environment.

When the help text refers to the online documentation, selecting 'help'(4) and 'online documentation' (5) switches to the online documentation menu.

For more information, read chapter 10 in the User Reference Manual. (Screenshot of the Error/Warning screen, with indicators of each item.)

A5.1.2 System failure dialogue

If there is no on-screen help available about the root cause or machine status:

- Consult the logging files, see [A5.1.11 Logging](#) .
- Consult [A5.1.8 Machine status check](#) .

Suspicious modules can be checked is with software tools, see [A5.1.2.1 Troubleshooting on module level](#)

A5.1.2.1 Troubleshooting on module level

Problem	Tool	location	Reference
I/O signals to and from <ul style="list-style-type: none"> • Lamp post • Safety circuit • Air supply • Auxiliary feeding • Verification tool. 	Maintenance & service tool, tab DIO. Note: These I/O signals can also be checked on the I/O module in the control supply unit.	Shortcut on the ASC desktop	A5.1.6.5 Digital I/O function test
Board transport			
• Functionality	Tip tools	Shortcut on APC desktop	A5.1.3 TIP tools
• Communication with the APC	Bitbus test tool	Shortcut on APC desktop	A5.1.4 Bitbus communication check
Placement head HA			
• Functionality	Tip tools	Shortcut on APC desktop	A5.1.3 TIP tools
• Communication with the APC	Bitbus test tool	Shortcut on APC desktop	A5.1.4 Bitbus communication check
Placement head DV			
• Functionality	Maintenance & service tool, tab DV heads	Shortcut on ASC desktop	A5.1.6.4 Placement head DV function check
• Communication with the APC	Maintenance & service tool, tab Synqnet	Shortcut on ASC desktop	A5.1.6.2 Synqnet function check
Vision			
• Functionality • Communication with the ASC	Topology browser (Camera test tool)	Shortcut on ASC desktop	A5.1.7 Vision hardware test tool
XY robot			
• Functionality	Maintenance & service tool, tab XY robot	Shortcut on ASC desktop	A5.1.6.3 XY robot function check
• Communication with the APC	Maintenance & service tool, tab Synqnet	Shortcut on ASC desktop	A5.1.6.2 Synqnet function check
Tray trolley			
• Functionality	Tip tools	Shortcut on APC desktop	A5.1.3.5 Tray trolley, testing via TIP tools
• Communication with the APC	Bitbus test tool	Shortcut on APC desktop	A5.1.4 Bitbus communication check
SVS Pro			
• Functionality, Communication aSC with SVS Pro on RS232	Command prompt, Hyperterminal	Shortcut in 'Start'.	A5.1.5 SVS Pro - process controller, communication check

FIGURE 52 Tools for troubleshooting on module level

A5.1.3 TIP tools

A5.1.3.1 TIP tools, start up procedure



NOTE: Make sure that the correct logoff procedure is performed whenever you have been logged on to the system.

1. Start up TIP tools

- Power up the machine.
- Wait until the Windows XP desktop appears.
- Stop the dialogue box 'Start controller' in the task bar.
(Connection to APC must proceed)
- Start 'Remote desktop' icon on desktop.
- Logon as user in the process controller: User name is 'user' with password 'user' (password is completely lower case).
- Start icon 'Start Process TIP tools'
- Start icon 'TIP tools'.
- Type: get programs.tip
Function tree is visible now.
- Select: option A - S.

***** ACM TEST-PROGRAMS. *****	
A -- TRP Test-Program.	<Transport>
B -- HDH Test-Program.	<Heads>
C -- FDR Test-Program 1.	<Tray-Trolley>
S -- STOP.	
MAKE YOUR CHOICE --> ...	

A5.1.3.2 TIP tools, logoff procedure

1. Log off TIP tools

- Select 'S'.
- At prompt >>> type: exit
- After using the TIP tools double-click on <Kill APC Processes> to stop all running process controller processes.
- Shutdown the process controller and system controller by double-click on <power-down>. This icon is located on the system controller.
- Re-start the machine.

***** ACM TEST-PROGRAMS. *****	
A -- TRP Test-Program.	<Transport>
B -- HDH Test-Program.	<Heads>
C -- FDR Test-Program 1.	<Tray-Trolley>
S -- STOP.	
MAKE YOUR CHOICE --> ...	

A5.1.3.3 Board transport, testing via TIP tools

- Start up TIP tools, see [A5.1.3.1 TIP tools, start up procedure](#)

**** TEST TRANSPORT-BELT MOTORS ****		
Select MOTOR.	Select SPEED. (mm/sec)	Select DIRECTION.
A -- RUN-IN. B -- WORK-AREA. S -- SPEED CHECK. 0 -- EXIT.	A -- ACM-IN. (350) B -- ACM-OUT. (350) C -- TRANSFER-BOARD. (550) D -- POSITION-BOARD. (20) E -- STOP. (0)	A -- FORWARD. B -- BACKWARD.
RUN-IN motor STOPPED.		
WORK-AREA motor STOPPED.		
<p>NOTE The speed values given in the Select SPEED column, are the speeds as they are defined in the Transport Controller memory.</p>		
MAKE A SELECTION.		

**** TEST MENU TRANSPORT SENSORS + SHEMA ****		
A -- Test TRANSPORT-LIGHT-SENSORS manual. B -- Test TRANSPORT-LIGHT-SENSORS automatic with a PCB. C -- Test SHEMA-IN and SHEMA-OUT. D -- Test SHEMA-IN. E -- Test SHEMA-OUT.		
0 -- EXIT.		
MAKE YOUR CHOICE ---> .		

**** TEST MENU LIFT-UNIT ****		
A -- Test LIFT-UNIT ZERO-COARSE Epd. B -- Test LIFT-UNIT HOME function. C -- Test LIFT-UNIT UP/DOWN. D -- CALIBRATE LIFT-UNIT. P -- PURGE FLASH-PROM.		
0 -- EXIT.		
MAKE YOUR CHOICE ---> .		

**** TEST MENU TRANSPORT WIDTH-ADJUSTMENT ****		
A -- Test TRANSPORT-HOME function. B -- Test TRANSPORT-WIDTH-ADJUSTMENT (ABSOLUTE). C -- Test TRANSPORT-WIDTH-ADJUSTMENT (RELATIVE).		
0 -- EXIT.		
MAKE YOUR CHOICE ---> .		

**** AUTOMATIC TEST GREEN and YELLOW LED'S ****		
<div style="border: 1px solid black; padding: 5px; width: fit-content;"> TRANSPORT CONTROLLER </div> <div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; background-color: green; margin-right: 5px;"></div> --> GREEN LED = ON </div> <div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; background-color: yellow; margin-right: 5px;"></div> --> YELLOW LED = ON </div>		
PRESS CTRL-C TO STOP.		

**** ENCODER-TEST RUN-IN * WORK-AREA ****		
RUN-IN: (Backw = pos.)	WORK-AREA: (Backw = pos.)	
DESIRED POSITION: -169	DESIRED POSITION: -214	
REAL POSITION: -169	REAL POSITION: -214	
TRACKING WARNINGS: 0	TRACKING WARNINGS: 0	
MAX. ZERO DRIFT LEVEL: 0	MAX. ZERO DRIFT LEVEL: 0	
POWER DIPS: 0	POWER DIPS: 0	
PRESS CTRL-C TO STOP.		

**** ENCODER-TEST WIDTH-ADJUSTMENT * LIFT-UNIT ****		
WIDTH-ADJUSTMENT: (Narrow = pos.)		
DESIRED POSITION:		
REAL POSITION:		
TRACKING WARNINGS:		
MAX. ZERO DRIFT LEVEL:		
POWER DIPS:		
LIFT-UNIT: (UP = pos.)		
DESIRED POSITION:		
REAL POSITION:		
TRACKING WARNINGS:		
MAX. ZERO DRIFT LEVEL:		
POWER DIPS:		
!! ATTENTION !! WHEN THE LIFT IS DOWN IT MAY COME UP. IS THIS ALLOWED? Y/N.		

**** ENDURANCE TEST MENU TRANSPORT AND LIFT-UNIT ****		
A -- Test TRANSPORT: PCB from RI to WA and back. NO LIFT-CLAMP. B -- Test TRANSPORT: PCB from RI to WA and back. LIFT-CLAMP. C -- Test LIFT-UNIT UP/DOWN. D -- Test TRANSPORT-BELTS.		
0 -- EXIT.		
MAKE YOUR CHOICE --->		

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```

***** MENU FRICTION-TESTS. *****

(...) A -- CHECK ONE COMPLETE CYCLE RUN-IN BELT.
(...) B -- CHECK ONE COMPLETE CYCLE WORK-AREA BELT.

      D -- EXECUTE OPTION A-B ONE BY ONE.

(...) E -- CHECK LIFT-UNIT ALONG A STROKE FROM: 1) Z=0 TO Z=-51 mm.
                                              2) Z=-51 TO Z=-12 mm.

(...) F -- CHECK TRANSPORT-WIDTH ALONG A STROKE FROM 50 UP TO 460 mm.

      0 -- EXIT.

MAKE YOUR CHOICE --->

```

- Log off TIP tools, see [A5.1.3.2 TIP tools, logoff procedure](#)

A5.1.3.4 Placement head HA, testing via TIP tools

- Start up TIP tools, see [A5.1.3.1 TIP tools, start up procedure](#)

```

***** MAIN TEST-MENU HEAD-HANDLER *****

A -- Test the VALVES.
B -- Test GREEN and YELLOW Led.
C -- Test Z-MOTOR.      (Signals and Movements)
D -- Test PHI-MOTOR.    (Signals and Movements)

E -- Test Z-FORCE CONTROL-UNIT.
F -- Execute VACUUM Measurement.

G -- Monitor FIRMWARE-Version.
H -- CHANGE CONFIGURATION.

I -- ENDURANCE-TESTS.
J -- .....

      0 -- EXIT.

MAKE YOUR CHOICE --->

```

```

***** TEST ALL VALVES *****

A -- SWITCH ON OPEN-GRIPPER VALVE.
B -- SWITCH ON VACUUM VALVE.
C -- SWITCH ON BLOWER VALVE.
D -- SWITCH ON RELEASE-TOOLBIT VALVE.

E -- AUTOMATIC ON/OFF OPEN-GRIPPER VALVE.
F -- AUTOMATIC ON/OFF VACUUM VALVE.
G -- AUTOMATIC ON/OFF BLOWER VALVE.
H -- AUTOMATIC ON/OFF RELEASE-TOOLBIT VALVE.

S -- SELECT HEAD.      (ACTIVE NOW = HEAD-1)

      0 -- EXIT.

MAKE YOUR CHOICE -->

```

HEAD-NR -> 1
* STATE *
.
.
.
.
.
.
.

```

***** AUTOMATIC TEST GREEN and YELLOW LED'S *****

TIP    HEAD-1    HEAD-2    HEAD-3    HEAD-4    H-DRIVE
-----
      IN CONFIG.  IN CONFIG.  NOT IN CONFIG.  NOT IN CONFIG.

PRESS CTRL-C TO STOP

```

```

***** TEST Z-MOTOR *****

A -- HOME HEAD-1.
B -- MOVE HEAD-1 TO Z-SAFE-POSITION (EPD).
C -- MOVE HEAD-1 UP/DOWN.

D -- FIND IMPACT-POINT HEAD-1.
E -- ENCODER CHECK HEAD-1.
F -- SHOW/CHANGE STATE HEAD-1.
G -- .....

S -- SELECT HEAD.      (ACTIVE NOW = HEAD-1)

      0 -- EXIT.

MAKE YOUR CHOICE --> .

```

OFFSET	
HEAD-1	incr.
HEAD-2	incr.
HEAD-3	NOT IN CFG.
HEAD-4	NOT IN CFG.

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***** TEST PHI-MOTOR *****

A -- HOME HEAD-1.
B -- MOVE PHI HEAD-1 LEFT/RIGHT.

C -- ENCODER CHECK HEAD-1.
D -- SHOW/CHANGE STATE HEAD-1.
E --

S -- SELECT HEAD. <ACTIVE NOW = HEAD-1>

0 -- EXIT.

MAKE YOUR CHOICE -->

***** MEASURE Z-FORCE *****

A -- RELEASE TOOLBIT HEAD-1.
B -- CHECK Z-FORCE SENSOR HEAD-1.

C --

S -- SELECT HEAD. <ACTIVE NOW = HEAD-1>

0 -- EXIT.

MAKE YOUR CHOICE -->

***** MEASURE VACUUM *****

A -- GRIP TOOLBIT HEAD-1.
B -- RELEASE TOOLBIT HEAD-1.
C -- EXECUTE VACUUM MEASUREMENT HEAD-1.
D -- EXECUTE VACUUM MEASUREMENT ALL CONFIGURED HEADS.
E --

S -- SELECT HEAD. <ACTIVE NOW = HEAD-1>

0 -- EXIT.

MAKE YOUR CHOICE -->

***** MAIN TEST-MENU HEAD-HANDLER *****

A -- Test the VALUES.

HDH Test-Software-Version: HDH-11*02*99

*** FIRMWARE VERSION-NR's ***

	IN CONFIG.	VERSION Nr.
HEAD-1 . . .	YES	HC--13.94
HEAD-2 . . .	YES	HC--13.94
HEAD-3 . . .	NO
HEAD-4 . . .	NO

0 -- EXIT.

***** PRESS ANY KEY TO CONTINUE *****

***** MAIN TEST-MENU HEAD-HANDLER *****

A -- Test the VALUES.
B -- Test GREEN and YELLOW Led.
C -- Test Z-MOTOR. <Signals and Movements>
D -- Test PHI-MOTOR. <Signals and Movements>

E -- Test Z-FORCE CONTROL-UNIT.
F -- Execute VACUUM Measurement.

G -- Monitor FIRMWARE-Version.
H -- CHANGE CONFIGURATION.

I -- ENDURANCE-TESTS.
J --

0 -- EXIT.

1 = ADD A HEAD TO THE CONFIG. 2 = REMOVE A HEAD FROM THE CONFIG. 3 = STOP.

***** DIAGNOSTICS *****

HEAD-1.
SPEED FACTOR.....: 100 %
WAIT-TIME.....: 0 ms.
MOVEMENT CLASS.....: 0

NR. OF Z-MOVES.....: 0
TOTAL Z-TIME.....: 0 Min.
NR. OF PHI-MOVES.....: 0
TOTAL PHI-TIME.....: 0 Min.

Z-TRACKING WARNINGS..: 0
PHI-TRACKING WARNINGS: 0
Z-ZERO DRIFT LEVEL...: 0
PHI-ZERO DRIFT LEVEL.: 0

NR. OF POWERDIPS.....: 0

***** ENDURANCE TEST MENU *****

A -- START ENDURANCE Z-MOTOR HEAD-1.
B -- START ENDURANCE PHI-MOTOR HEAD-1.
C -- START ENDURANCE Z*PHI-MOTOR HEAD-1.
D -- STOP ENDURANCE Z-MOTOR HEAD-1.
E -- STOP ENDURANCE PHI-MOTOR HEAD-1.
F -- STOP ENDURANCE Z*PHI-MOTOR HEAD-1.

G -- RESET DIAGNOSTICS OF HEAD-1.
H -- SET SPEED FACTOR. <default=100%>
W -- SET WAIT-TIME BETWEEN TWO MOVES.

R -- REMOVE TOOLBIT.
S -- SELECT HEAD. <ACTIVE NOW = HEAD-1>
U -- UPDATE DIAGNOSTICS.

0 -- EXIT.

MAKE YOUR CHOICE -->

- Log off TIP tools, see [A5.1.3.2 TIP tools, logoff procedure](#)

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A5.1.3.5 Tray trolley, testing via TIP tools

- Start up TIP tools, see [A5.1.3.1 TIP tools, start up procedure](#)

C - FDR Test Program. **T** - Tray trolley commands
N - New controller

Select section
A - Purge flashprom
B - Read all parameters from flashprom
C - Reset all parameters in flashprom
D - PID parameters lift to flashprom
E - PID parameters puller to flashprom
F - PID parameters snap-in to flashprom
G - Movement classes to flashprom
H - Diagnostics to flashprom
I - Offset parameters to flashprom
J - Calibration parameters to flashprom
0 - exit

C - Calibration

A - Calibrate lift offset
B - Set lift / puller / snap-in offset manually
D - Write pitch / lift / free position
E - Write hook / park / lock position
F - Write eject / hook zero / - position
G - Write pick / eject / - position
H - Write level zero / pick / - position
R - Read position from flashprom
S - Select servo, 0=lift / 1=puller / 2=snap-in
U - Update real position
W - Write positions to flashprom

M - Maintenance and Service

D - Display sensor state
I - Initialise trolley
L - Move lift to selected tray: 1=slide / 2=hook / 3=eject
P - Move puller: 1=pick / 2=lift / 3=park / 4=hook / 5=eject
S - Move snap-in: 1=free / 2=lock
T - Tray selection
V - Verify sensor adjustments: 1=zero sensors /
2=carrier in store / 3=safe on lift
X - Shutdown trolley
0 - exit

E - Endurance

A - Start endurance all
B - Start endurance lift
C - Start endurance puller
D - Start endurance snap-in
P - Set servo endurance positions
R - Reset diagnostics
U - Update diagnostics
S - Set speed factor
0 - exit

S - Servo

A - Lift amplifier on
B - Puller amplifier on
C - Snap-in amplifier on
M - Movement class menu
P - PID Menu
R - Read servo positions
U - Update servo diagnostics
S - Set speed factor
0 - Exit

X - Extra Tools

C - Check Z-level
S - Sensor test
B - Between test
F - Full load test
J - Eject all carriers
E - Endurance mode
K - Component class
W - Write contents of flash to file

- Log off TIP tools, see [A5.1.3.2 TIP tools, logoff procedure](#)

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A5.1.3.6 Process controller, software and hardware check via TIP tools

For basic checks on the software and hardware of the process controller, a tipscript (aitcheck.tip) has been made.

1. Start-up TIP tools

- Logon to the system as 'Administrator'.
- Wait until the process controller Status window is disappeared (This means the process controller is booted)

Note: If it takes longer than 5 minutes for the process controller Status window to disappear it is possible that the process controller booted before the boot procedure of the system controller was finished. In that case one could also continue to the next step.

- Double-click on <VNC APC> on the desktop to start the Vnc program
- Wait until the desktop of the process controller becomes visible.

Note: If the program could not connect to the process controller it will give a warning. This means the process controller is probably not booted yet, wait a few seconds and try again.

- On the desktop of the process controller double-click on <Start aPC processes for TIP>. This will start only those processes that must run for the use of the TIP tools.
- On the desktop of the process controller double-click on <TIP tools> to start the TIP tools.
- Enter: `get aitcheck`
- Enter: `Thw_ok` or `Thw_endurance`.

A5.1.4 Bitbus communication check

Tray trolley operations are controlled by a Bitbus communication protocol.

For the Bitbus controller, the tray trolley controller is a communication 'node' with a fixed address. The address is linked to the physical position of the node in the machine.

Node	Part
1	Placement head front left
2	Placement head front right
3	Placement head rear right
4	Placement head rear left
8	Feeding 1 (front left)
9	Feeding 2 (front right)
10	Feeding 3 (rear right)
11	Feeding 4 (rear left)
16	Board transport
255	Bitbus card in process controller

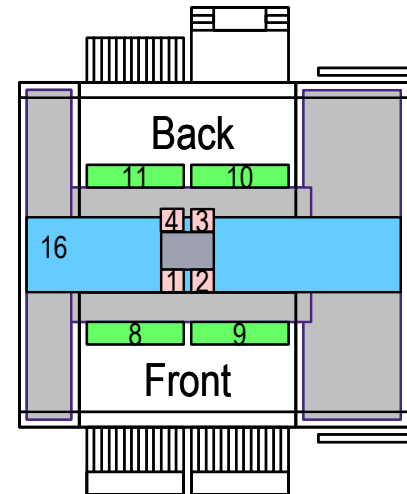


FIGURE 53 Bitbus nodes

To debug Bitbus communications, a software tool called 'Bapimon' is available, which is located on the APC.

To use this tool:

- Start 'Bapimon' from the remote desktop
(or go to APC DATA (D:) user/aPc/exe/bapimon.exe).

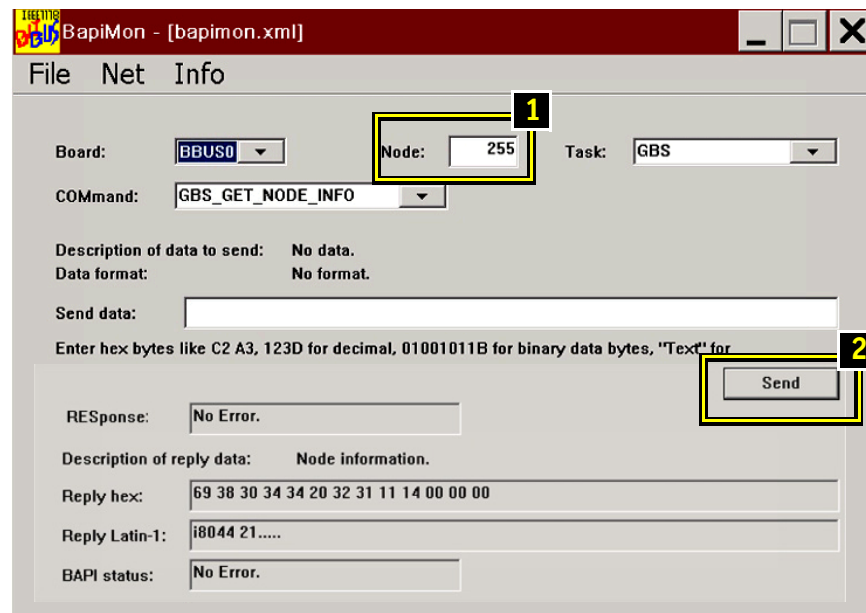


FIGURE 54 Bitbus communication check

1. Enter node number to test.
2. Send data to check response from node.

A5.1.4.1 Bitbus, search net

Search Net is useful to scan all connected nodes quickly. Communication with all possible nodes attempted; all proper communicating nodes are listed. If a node fails to show on the list, this node is not present, or the communication lines / node needs to be checked.

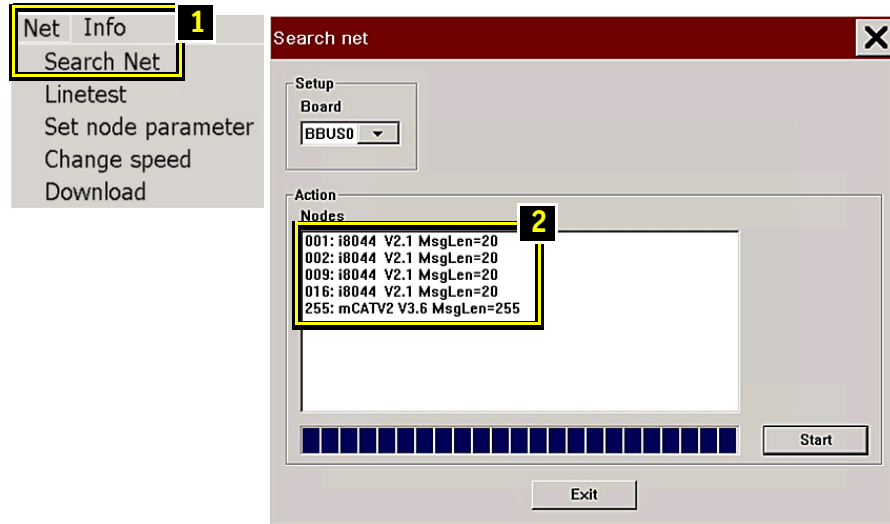


FIGURE 55 Bitbus, search net

1. Select 'Search Net'.
2. All found nodes listed (all OK in example).



NOTE: The displayed report is configuration dependant.
If no tray trolley is configured, the feeder sections will not be recognized.
If there are problems with the bitbus nodes the report shows strange values.

■ **Possible root cause:**

- Cable damage.
- No locking function of the connector on the controller board: replace connector.
- Defective controller board.

Defective bitbus card (in this case no node will be found at all).

A5.1.4.2 Bitbus, line test

Line test can be used to check e.g. for bad connectors and cable faults. Continuous communication with the selected node is started and communication errors are counted. While manipulating the cables and connectors, bad connections can be identified.

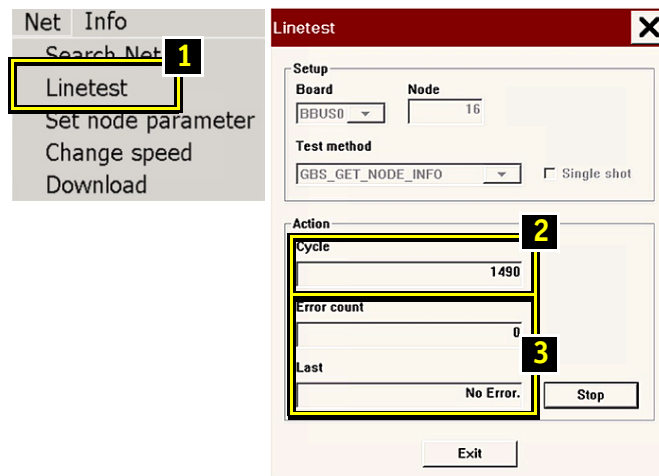


FIGURE 56 Bitbus, line test

1. Select 'Linetest' and select the node to be tested.
2. Conscious testing of communication with selected node.
3. Errors occurred.

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A5.1.5 SVS Pro - process controller, communication check

1. Test the internal network connection

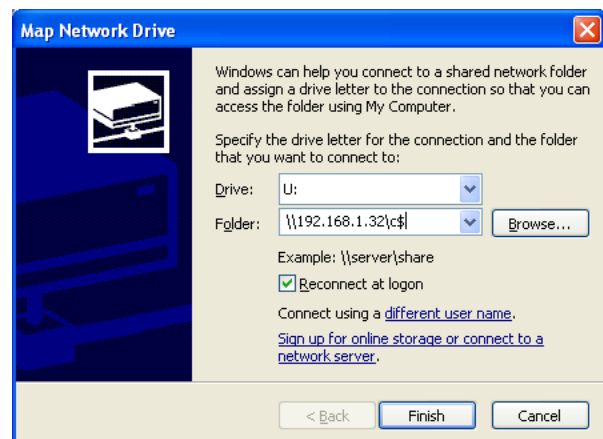
- Select 'power down' user interface.
- Select 'Remote desktop' on the system controller (ASC).
- Log on as 'User' with password 'User'.
- Open a 'command prompt'.
- Type in 'Ping 192.168.1.32' and select 'Enter'.
 - * If the connection is OK, there will be a reply from the SVS-Pro controller. Continue with step 2. [Test the RS232 connection](#) .
 - * If there is no reply; Check the connection between SVS-PRO controller X63 and process controller (APC) , see [B5.3.2 Controllers, connections](#)
- The connection between process and system controller is OK after starting the 'Remote desktop'.

2. Test the RS232 connection

- Select 'Remote desktop' on the system controller (ASC).
- Log on as 'User' with password 'User'.
- Check if on the desktop of the process controller (APC) the 'VNC' short cut is present, or if the VNC folder is present in C:\apc\programfiles.
 - * If Yes, continue with step 4. [Test the connection](#) .,
 - * if No, go to 3. [Map the C: drive of the SVS-Pro controller](#)

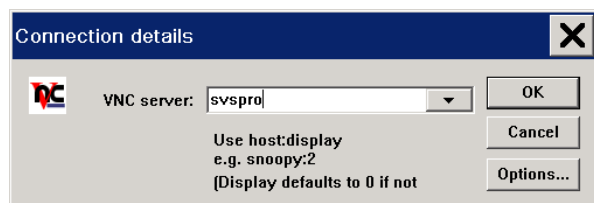
3. Map the C: drive of the SVS-Pro controller

- Open Windows explorer.
- Select 'Map network drive'.
- Fill out '\\192.168.1.32\C\$' in the map network drive window.
- Select 'Finish'.
- Select on the SVS pro controller the c:/program files/VNC folder
- Select 'Copy'.
- "Go to the c:/aPC/programfiles folder on the process controller (APC).
- "Select 'Paste'.



4. Test the connection

- If the folder is present; Create a short-cut on the desktop of the process controller (APC) from the 'VNC Viewer.exe' file.
- Double click on the 'VNC' short cut on the process controller (APC) desktop
- Fill out 'SVSPro' in the 'Connection details' window
- Select OK.
- Fill out password; " a "
- Select OK.



Note: A remote desktop connection is made from the process controller (APC) to the SVS Pro controller.

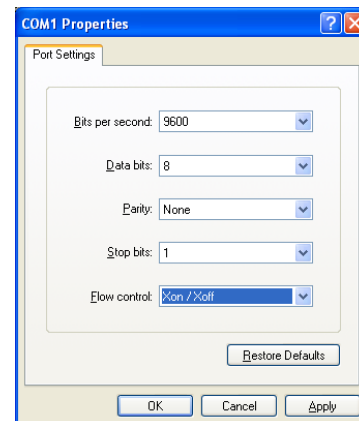
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- Select 'Start'-'Programs'-'Accessories'-'Communications' 'HyperTerminal' on the SVS Pro desktop.

Note: Be sure to select the "Start" on the SVS Pro desktop, not the 'Start' on the system controller (ASC) desktop.

- Select 'File' and 'New connection' in the hyperterminal window.
- Give a name to the new connection.
- Select 'OK'.
- Select 'COM1' in the 'Connect To' window.
- Select 'OK'.
- Fill out the 'Output parameters' in the 'COM1 Properties' window.
- Select 'OK'.
- Select "Call" in the Hyperterminal window.
- Go to the system controller (ASC) desktop to open a hyperterminal.
- Select 'Start'-'Programs'-'Accessories'-'Communications'-'HyperTerminal' on the system controller (ASC) desktop.
- Select 'File' and 'New connection' in the hyperterminal window.
- Give a name to the new connection.
- Select 'OK'.
- Select 'COM3' in the 'Connect To' window.
- Select 'OK'.
- Select "Call" in the Hyperterminal window.
- Type in any text characters.
- The hyperterminal session on the SVS Pro will show characters if the connection is OK.
- Type in the SVS Pro Hyperterminal session any text characters.
- The hyperterminal session on the system controller (ASC) will show characters if the connection is OK.

Note: If the characters are not presented; check the connection between SVS-Pro.X64 and ASC.X21, see [B5.3.2 Controllers, connections](#)



A5.1.6 Hardware maintenance & service tool, overview

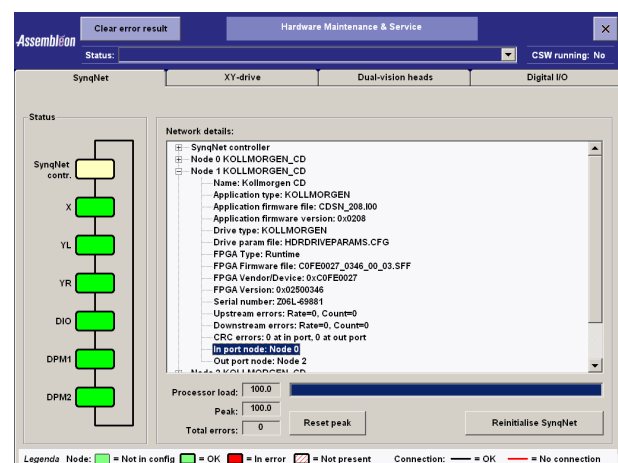
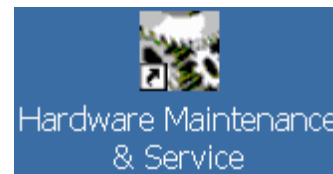
The hardware maintenance & service tool consists of four different functions:

- [Synqnet function check](#)
The Synqnet tool is used to check communication between the XY controller and the motion amplifiers (XY drive), the placement head DV controllers (if present) and the Digital I/O.
- [XY robot function check](#)
The XY robot tool can be used to check the XY robot functionality, including the status of the amplifier and encoder of each axis.
- [Placement head DV function check](#)
The placement head DV tool can be used to check the placement head DV functionality, including the pneumatic functions of the Z-slides and the motors and encoders of the placement heads.
- [Digital I/O function test](#)
The digital I/O tool displays the I/O status similar to the I/O hardware in the control supply unit. It can also be used to set actuators connected to the output modules in the control supply unit.

A5.1.6.1 Hardware maintenance & service tool, start-up

1. Start the hardware maintenance & service tool

- Power down the machine.
- Power up the machine.
- As soon as the 'Autostart' pop-up screen appears, close this screen in order to prevent the control software to start up.
- Wait until the system controller (ASC) desktop appears, and the pop up screen (APC status window) shows 'Finished firmware validation and downloading'.
- Close the pop up screen.
- From the ASC desktop, double click on the 'Hardware Maintenance & Service' shortcut.
- Wait until the 'Hardware Maintenance & Service' tool is visible (four tabs).



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A5.1.6.2 Synqnet function check

- Activate the hardware maintenance & service tool, see [A5.1.6.1](#)

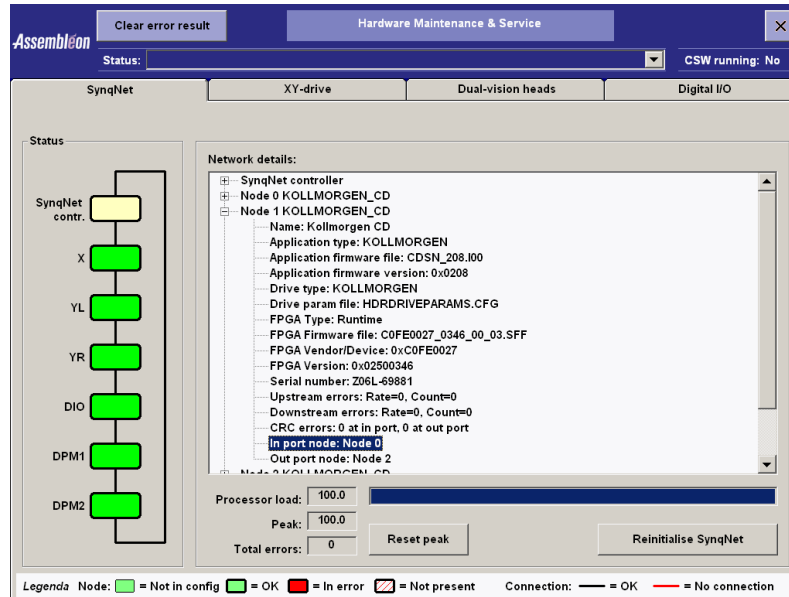


FIGURE 57 Synqnet function check

The Synqnet tool consists of one tab.

At the left side of the screen the different nodes connected to the Synqnet are shown:

- The Synqnet controller is the XY controller in the process controller. It is shown in yellow.
- All other nodes are green if they are OK. All other possible statuses are displayed in the legend at the bottom.
- The lines between the nodes represent the Synqnet cables. Together they form a ring.

A red coloured connection means that the **connection** is lost.

This does not mean the **communication** is lost. When more than one cable is broken/disconnected, the missing nodes cannot communicate with the controller any more.

At the right side of the screen details about the nodes are shown.

- If for instance the "in port" or "out port" cable of one of the nodes is missing, this will be displayed in red text.
- The processor load and peak reset button apply to the XY controller in the process controller, but have no function for trouble shooting.
- By pressing the "Reinitialize Synqnet" button, the Synqnet communication will be reset. If anything changes with one of the Synqnet nodes or the connections, always first reinitialize Synqnet, in order to check the latest status.

A5.1.6.3 XY robot function check

- Activate the hardware maintenance & service tool, see [A5.1.6.1](#)

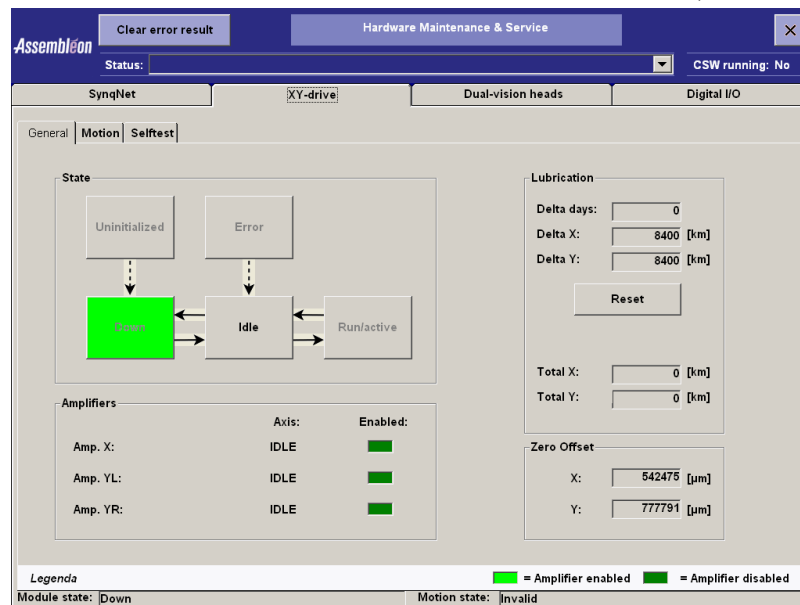


FIGURE 58 XY robot General

The XY robot tab consists of three sub tabs.

The **General** tab, shows the state of the XY robot and also offers the possibility to change the state (following the arrows).

State	MODULE state	Sensors/encoders active?
Uninitialized	Undefined, powered on	No
Down	Software is initialised, but the module NOT. This means NO errors will be generated from the module (XY robot in this case). When (parts of) the XY robot hardware are not present (missing amplifier e.g.), man can still use the M&S tool for the other functions (digital I/O, SynqNet and RZ modules)...	???
Idle	'2' on motion amplifier(s). Amplifier is initialised, but not ready yet to perform actions (servo not enabled).	Yes
Run/active	'2.' on motion amplifier(s). Amplifier is ready for action.	Yes
Error	Module in error	Undefined

FIGURE 59 XY robot, explanation of the different states

When starting the tool, the XY robot will be 'Down'.

In order to manipulate the XY robot:

- Click on 'Idle'.
- Click on 'Run/active'.

Only when the XY robot is in the 'Run/active' state, it is possible to home the XY robot. In this state all displays on the three motion amplifiers (in the control supply unit) should show '2.' (two with a dot).

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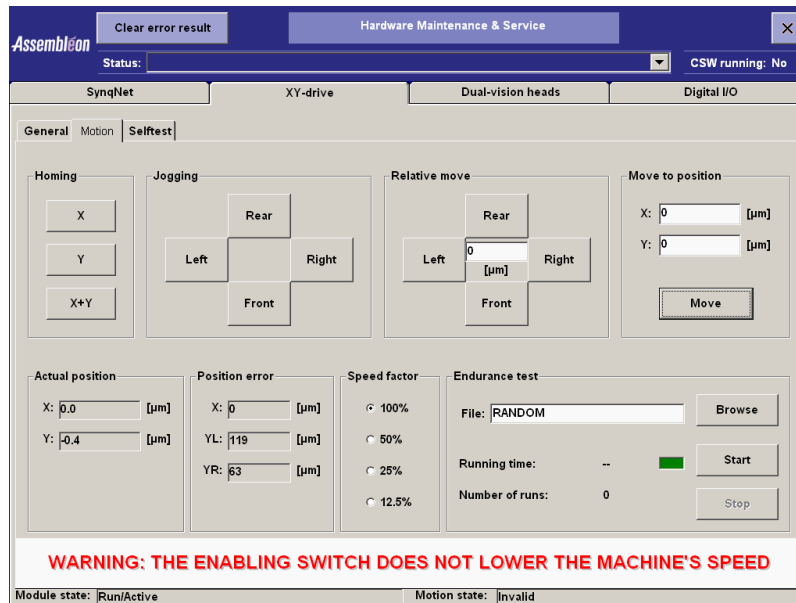


FIGURE 60 XY robot Motion tab

The **Motion** tab, offers the possibility to home the XY robot, either axis by axis or all in the normal sequence (first X, then Y). Note, the XY robot must be in 'Run/active' state before it is possible to home.

All other buttons in this screen offer the possibility to move the XY robot. By setting the speed factor the speed can be reduced to 50%, 25% or 12.5%.

Starting the 'Endurance test' will cause the XY robot to move in a pre-defined pattern. (when an endurance test file is chosen, when the file name is left to "RANDOM", the XY-robot moves in a random way THROUGH THE WHOLE WORKAREA)

CAUTION: This function is particular dangerous when there are heads mounted, but are not in their most upper position. When heads are on the machine, it is recommended to initialise these and to enable servo power on the heads to keep them in their upper position.

WARNING: Never use the enabling switch when using this diagnostic tool. The speed of the XY robot will not be reduced!

The **Self test** will be implemented in the future.

A5.1.6.4 Placement head DV function check

Activate the hardware maintenance & service tool, see [A5.1.6.1](#)

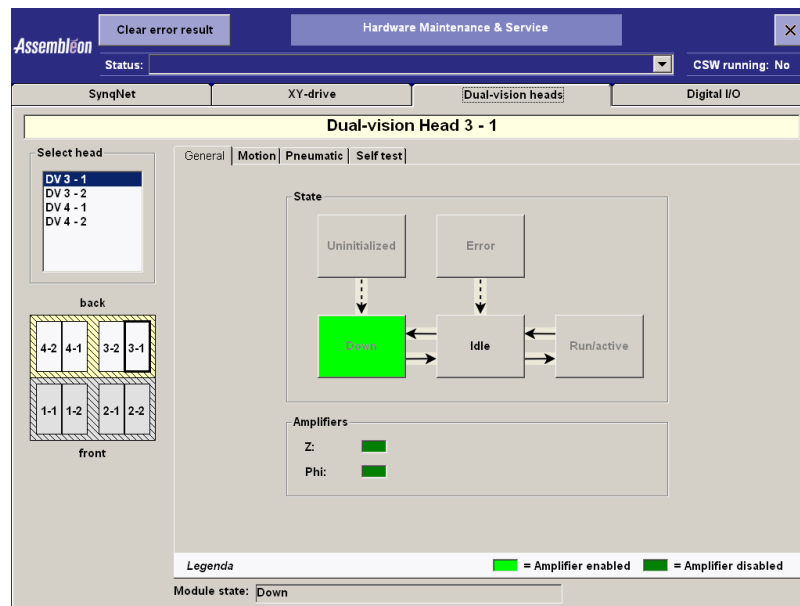


FIGURE 61 Placement head DV

The placement head DV tool consists of four tabs.

The **General** tab, shows the state of the placement head DV and offers the possibility to change the state (following the arrows).

State	Placement head DV controller state (LED)	Sensors active?
Uninitialized	Undefined, powered on	No
Down	Undefined, powered on	Yes
Idle	Axis (Z and RZ (Phi)) LEDs off	Yes
Run/active	Axis (Z and RZ (Phi)) LEDs on	Yes
Error	Undefined, powered on	Undefined

FIGURE 62 Placement head DV controller, explanation of the different states (LED)

After starting the tool, the placement heads DV will be in the 'Down' state. In order to manipulate the placement heads DV:

- Select the head at the left side of the screen
- Click on 'Idle'.
- Click on 'Run/active'.

Only when the placement heads DV are in the 'Run/active' state, it is possible to home the placement heads DV. In this state the 2 axis LEDs of the concerning head on the placement heads DV controllers are green.

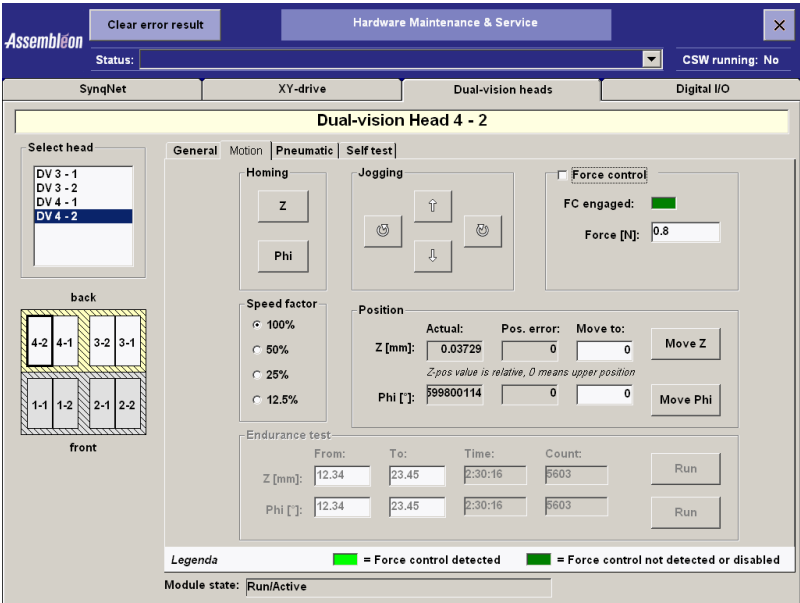


FIGURE 63

The **Motion** tab, offers the possibility to home the placement heads DV, either axis by axis or all in the normal sequence (first Z, then RZ (Phi)). Note, the placement head DV must be in 'Run/active' state before it is possible to home.

The jogging buttons in this screen offer the possibility to move the placement head DV that is selected at the left by small increments. By setting the speed factor the speed can be reduced to 50%, 25% or 12.5%. It is also possible to move the placement head DV to a defined position in Z and RZ (Phi).

Starting the 'Endurance test' will cause the placement head DV to move between defined positions in Z and RZ (Phi).

Force control can be set to a certain value for test purpose in the right upper corner of this screen.

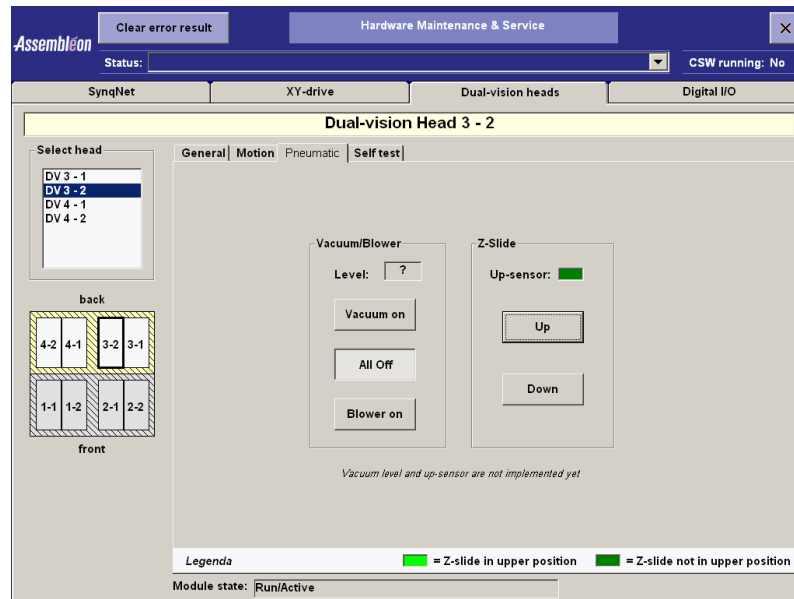


FIGURE 64

The **Pneumatic** tab, offers the possibility to check the pneumatic functions of each placement head DV.

By switching on the vacuum to a certain placement head DV it is possible to check if vacuum works correctly and if vacuum is applied to the correct placement head, for instance after replacing parts.

The Z-slide is mechanically combined for two heads (3-1 & 3-2, 4-1 & 4-2). When clicking on the 'Down' button the Z-slide is moved down by compressed air and the 'Up-sensor led' in the screen should go off. When clicking on the 'Up' button the Z-slide is moved up by a spring and the 'Up-sensor led' in the screen should turn on again.

The **Selftest** tab will be implemented in the future.

A5.1.6.5 Digital I/O function test

Activate the hardware maintenance & service tool, see [A5.1.6.1](#)

The digital I/O tool consists of five tabs. The I/O's shown in the last three tabs are a functional subset of the I/O's shown in the first two tabs.

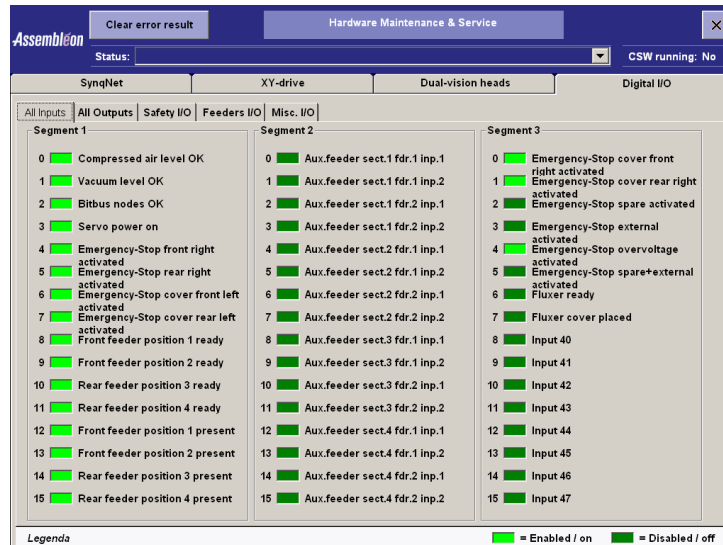


FIGURE 65 All inputs

The **All Inputs** tab provides a complete overview of all input signals.

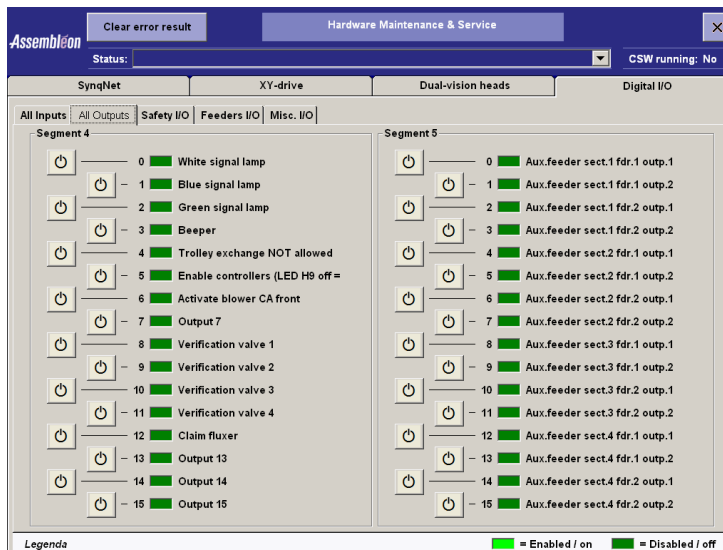


FIGURE 66 All outputs

The **All Outputs** tab shows all outputs. The status of each output signal can be viewed (green LEDs) and each output can be activated or deactivated by clicking the button.

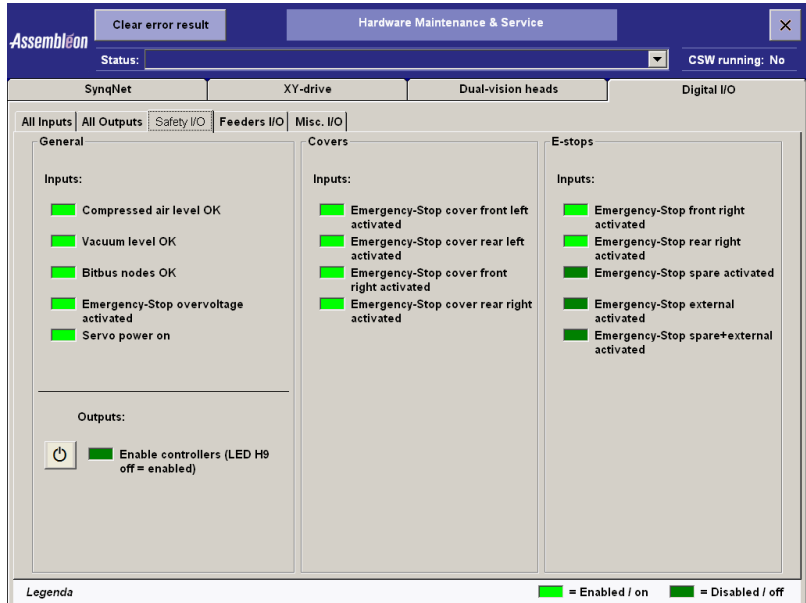


FIGURE 67 Safety I/O

The **Safety I/O** tab provides an overview of all input signals and one output button concerning the safety system.

The colour of the LEDs is the same as on the digital I/O.

When a safety input is enabled (green LED is on), this means that the according switch operated. For instance, in the example shown above the emergency stop buttons are not pressed and all covers are closed.

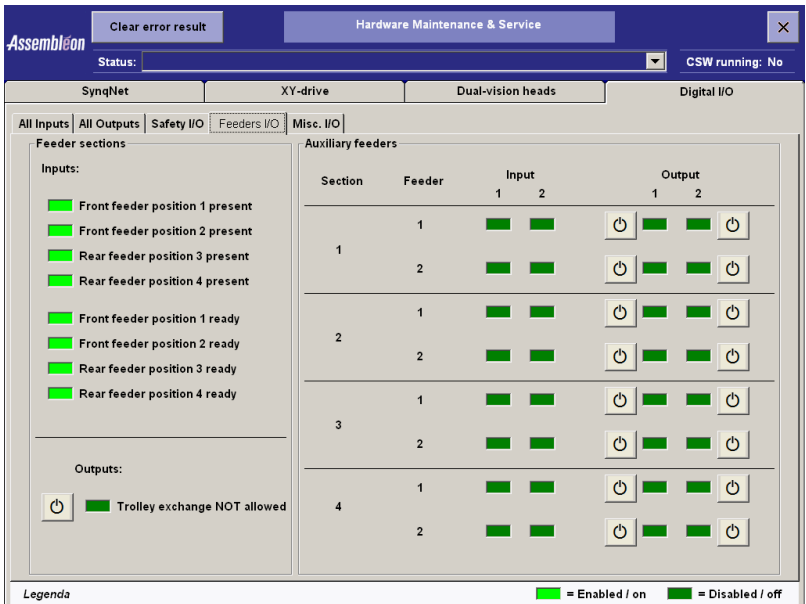


FIGURE 68 Feeders I/O

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The **Feeder I/O** tab provides an overview of both input signals and output buttons concerning the feeders.

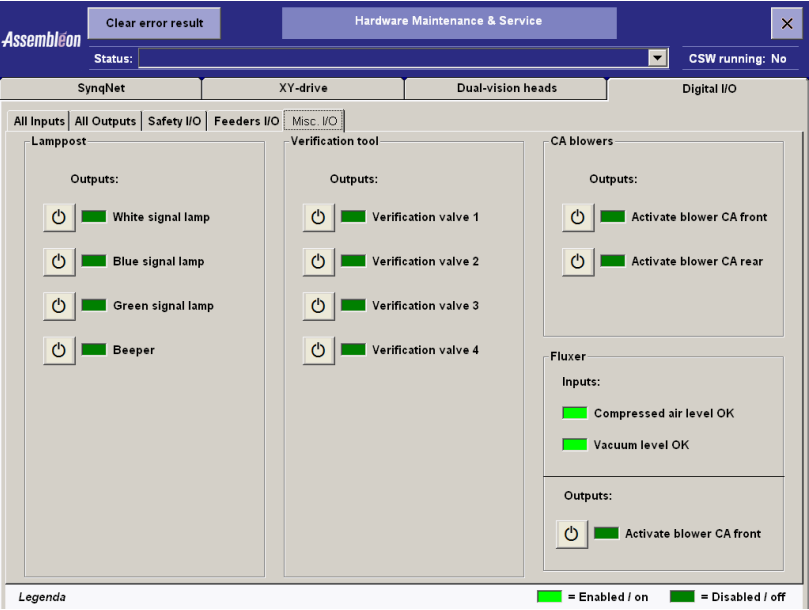


FIGURE 69 Misc. I/O

The **Misc. I/O** tab provides the possibility to test the lamp post, activate valves for the verification tool, activate the blower to the CA cameras and control the fluxer signals.

A5.1.7 Vision hardware test tool

1. Startup the vision hardware test tool

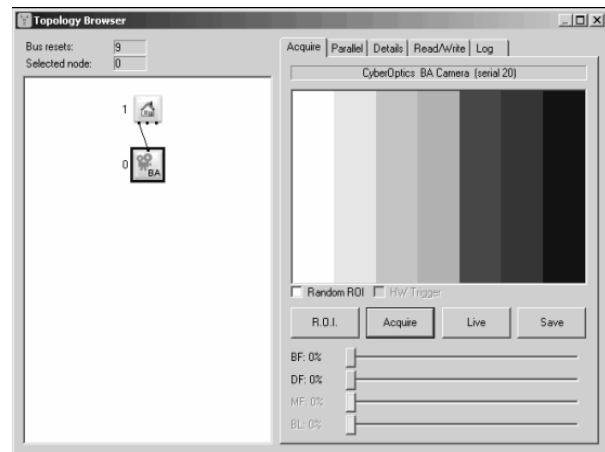
- Power down the machine.
- Power up the machine.
- As soon as the 'Autostart' pop-up screen appears, close this screen in order to prevent the control software to start up.
- Wait until the system controller (ASC) desktop appears, and the pop up screen (APC status window) shows 'Finished firmware validation and downloading'.
- Close the pop up screen.
- Double click on the vision hardware test tool from the system controller desktop.

2. Check the camera(s)

- Note which cameras are visible in the left window.
- Click on the front CA camera and check its details
- Activate the camera by clicking on "Live".

Note: Make sure the illumination settings are OK.

- Stop image intake by clicking on "Live" again.
- Also try taking one image with and without hardware trigger
- Take simultaneous live images from three cameras.



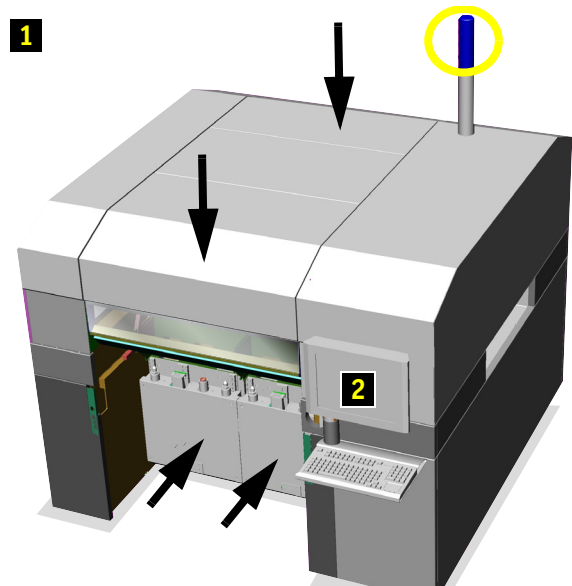
A5.1.8 Machine status check

The machine status can be checked by checking the LEDs.

1. Pre-start actions

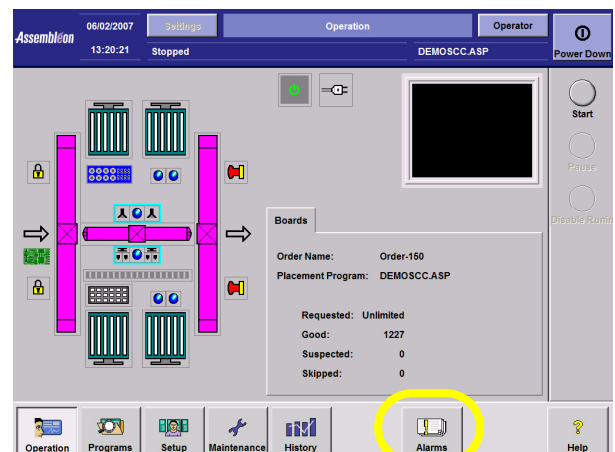
- Close front and rear covers.
- Release both emergency stop buttons.
- Be sure that :
 - * All trolley slots are occupied with trolleys, safety covers or feeder banks.
 - * The machine is powered up and started.
 - * A placement program is loaded.

The machine must be in idle state now: Lamp post: **white**

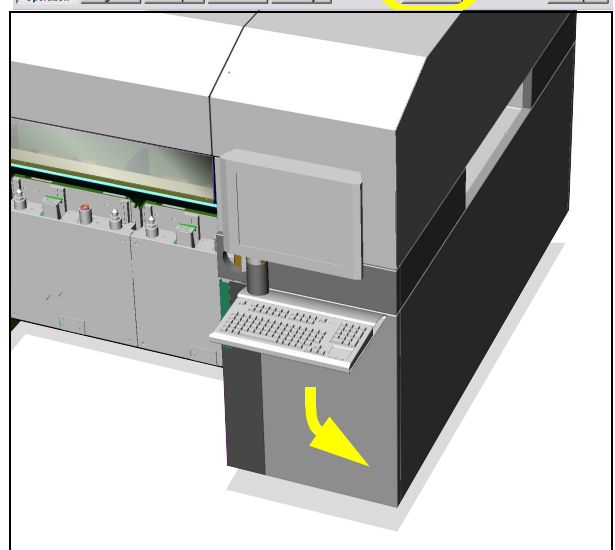


2. Check user interface (2)

- Select 'alarm' to check for warnings and errors.

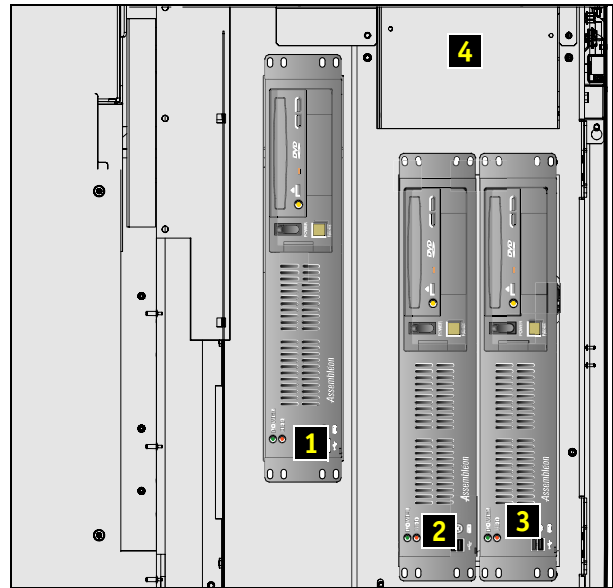


3. Open the front door of the machine



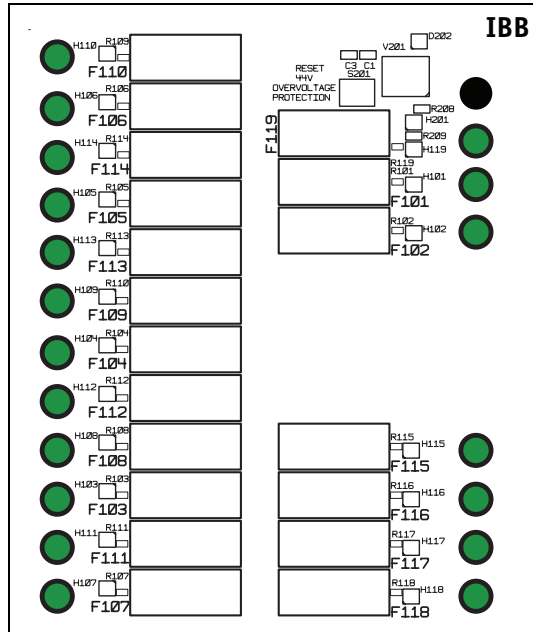
4. PC, SC, SVS Pro controller LEDs

- Check **POWER LED** status of
 - * SVS Pro controller (1, when mounted)
 - * Process controller (2)
 - * System controller (3).
- POWER LEDs must be **ON, GREEN**
- Check LEDs on IBB (interconnection board base) (4), see step 5.



5. IBB (interconnection board base), LEDs

AUX4	44V - H110
AUX4	24V - H106
AUX4 ES	44V - H114
AUX3	24V - H105
AUX3 ES	44V - H113
AUX3	44V - H109
AUX2	24V - H104
AUX2 ES	44V - H112
AUX2	44V - H108
AUX1	24V - H103
AUX1 ES	44V - H111
AUX1	44V - H107



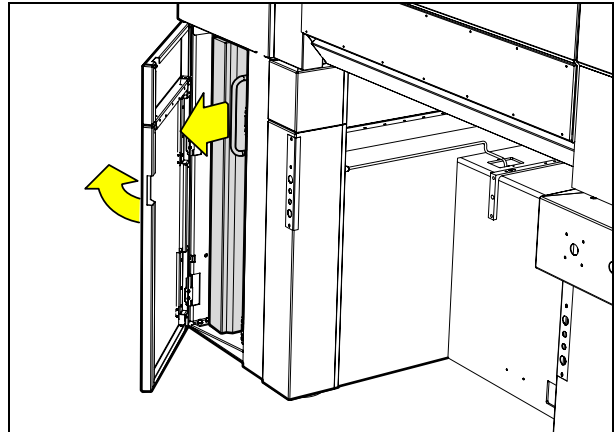
H201 - 44V	ES
H119 - 24V	FLUX
H101 - 24V	DIO
H102 - 24V - CAM	
H115 - 44V	LU1
H116 - 44V	LU2
H117 - 44V	LU3
H118 - 44V	LU4

- Leds to be **ON, GREEN**

LED		Fuse
H101	24V - DIO Input/output	4AT
H102	24V - Camera	4AT
H103	24V - Aux. feeding S1	2AT
H104	24V - Aux. feeding S2	2AT
H105	24V - Aux. feeding S3	2AT
H106	24V - Aux. feeding S4	2AT
H107	44V - Aux. feeding S1	2AT
H108	44V - Aux. feeding S2	2AT
H109	44V - Aux. feeding S3	2AT
H110	44V - Aux. feeding S4	2AT
H111	44V - Emergency Stop - Aux. feeding S1	2AT
H112	44V - Emergency Stop - Aux. feeding S2	2AT
H113	44V - Emergency Stop - Aux. feeding S3	2AT
H114	44V - Emergency Stop - Aux. feeding S4	2AT
H115	44V - Trolley lift 1	2AT
H116	44V - Trolley lift 2	2AT
H117	44V - Trolley lift 3	2AT
H118	44V - Trolley lift 4	2AT
H119	24V - Fluxer	4AT
LED to be OFF :		
H201	44V - Over voltage protection	-

6. Open the rear door of the machine

- Pull out the control supply unit.



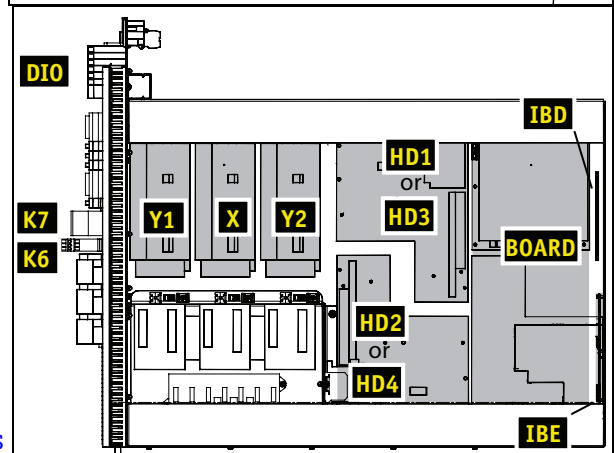
7. Control supply unit, LEDs

- **DIO** see 8. Digital IO (DIO), LEDs
- **K7** see 9. Phase guard relay (K7)
- **K6** see 10. Safety relay (K6)
- **IBE** see 11. IBE (interconnection board electrics)
- **IBD** see 12. IBD (interconnection board drives)
- **BOARD** see 14. Transport controller and 13. Transport amplifier
- **X, Y1, Y2** see 16. Motion amplifiers XY robot
- **HD3, HD4** * see 15. Placement head HA controllers

Not shown in picture:

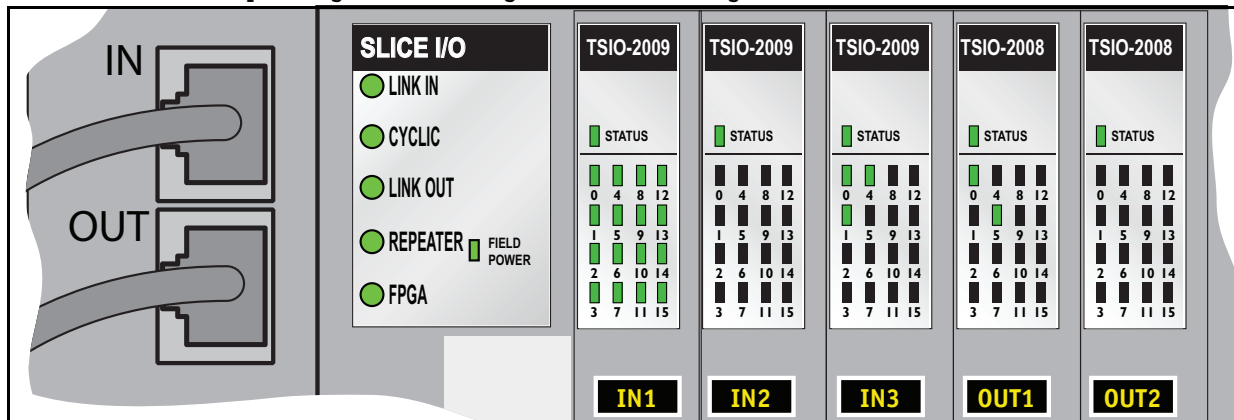
- **HD1, HD2** * . see 17. Placement head DV controllers

*) Placement heads HA can be located on HD1, HD2 as well.
Placement heads DV can be located on HD3, HD4 as well.



8. Digital IO (DIO), LEDs

Depending on the configuration, there might be differences.



LEDs to be **ON, GREEN**

Slice I/O	
LINK IN	Synqnet IN from Y2 amplifier
CYCLIC	-
LINK OUT	Synqnet OUT to Y2 placement DV controller
REPEATER	-
FPGA	Field programmable gate array
FIELD POWER	-

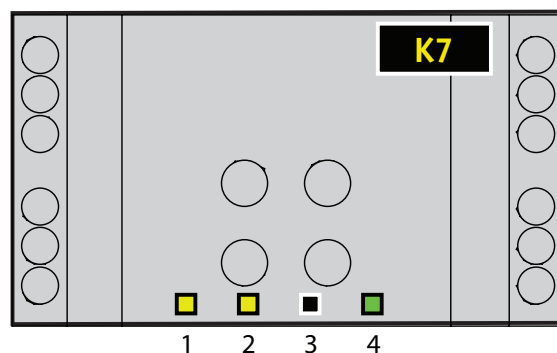
LED checks.fm

Inputs		Outputs	
IN1-0	Compressed Air Level OK	OUT1-0	Lamp White (Idle)
IN1-1	Vacuum Level OK	OUT1-1	Lamp Blue (Error)
IN1-2	Bitbus Nodes OK	OUT1-2	Lamp Green (Running)
IN1-3	Servo Power On	OUT1-3	Audio Beeper
IN1-4	Emergency Stop Front	OUT1-4	Trolley Exchange
IN1-5	Emergency Stop Rear	OUT1-5	Quick Stop Bitbus Nodes
IN1-6	Emergency Stop Cover Open Front left	OUT1-6	Blower CA front , CA rear
IN1-7	Emergency Stop Cover Open Rear left	OUT1-7	-
IN1-8	Feeder Ready Section 1	OUT1-8	Valve 1 (verification tool)
IN1-9	Feeder Ready Section 2	OUT1-9	Valve 2 (verification tool)
IN1-10	Feeder Ready Section 3	OUT1-10	Valve 3 (verification tool)
IN1-11	Feeder Ready Section 4	OUT1-11	Valve 4 (verification tool)
IN1-12	Emergency Stop Trolley Lift 1	OUT1-12	Claim fluxer
IN1-13	Emergency Stop Trolley Lift 2	OUT1-13	-
IN1-14	Emergency Stop Trolley Lift 3	OUT1-14	-
IN1-15	Emergency Stop Trolley Lift 4	OUT1-15	-
Inputs		Outputs	
IN2-0	Input aux. Feeding Front S1-C1-1	OUT2-0	Output aux. Feeding Front S1-C1-1
IN2-1	Input aux. Feeding Front S1-C1-2	OUT2-1	Output aux. Feeding Front S1-C1-2
IN2-2	Input aux. Feeding Front S1-C2-1	OUT2-2	Output aux. Feeding Front S1-C2-1
IN2-3	Input aux. Feeding Front S1-C2-2	OUT2-3	Output aux. Feeding Front S1-C2-2
IN2-4	Input aux. Feeding Front S2-C1-1	OUT2-4	Output aux. Feeding Front S2-C1-1
IN2-5	Input aux. Feeding Front S2-C1-2	OUT2-5	Output aux. Feeding Front S2-C1-2
IN2-6	Input aux. Feeding Front S2-C2-1	OUT2-6	Output aux. Feeding Front S2-C2-1
IN2-7	Input aux. Feeding Front S2-C2-2	OUT2-7	Output aux. Feeding Front S2-C2-2
IN2-8	Input aux. Feeding Rear S3-C1-1	OUT2-8	Output aux. Feeding Rear S3-C1-1
IN2-9	Input aux. Feeding Rear S3-C1-2	OUT2-9	Output aux. Feeding Rear S3-C1-2
IN2-10	Input aux. Feeding Rear S3-C2-1	OUT2-10	Output aux. Feeding Rear S3-C2-1
IN2-11	Input aux. Feeding Rear S3-C2-2	OUT2-11	Output aux. Feeding Rear S3-C2-2
IN2-12	Input aux. Feeding Rear S4-C1-1	OUT2-12	Output aux. Feeding Rear S4-C1-1
IN2-13	Input aux. Feeding Rear S4-C1-2	OUT2-13	Output aux. Feeding Rear S4-C1-2
IN2-14	Input aux. Feeding Rear S4-C2-1	OUT2-14	Output aux. Feeding Rear S4-C2-1
IN2-15	Input aux. Feeding Rear S4-C2-2	OUT2-15	Output aux. Feeding Rear S4-C2-2
Inputs		Outputs	
IN3-0	E-stop Cover Open Front Right		
IN3-1	E-stop Cover Open Rear Right		
IN3-2	E-stop spare		
IN3-3	E-stop External		
IN3-4	No overvoltage (44V)		
IN3-5	E-stop spare +external		
IN3-6	Fluxer ready		
IN3-7	Fluxer cover placed		
IN3-8	-		
IN3-9	-		
IN3-10	-		
IN3-11	-		
IN3-12	-		
IN3-13	-		
IN3-14	-		
IN3-15	-		

LED checks.fm

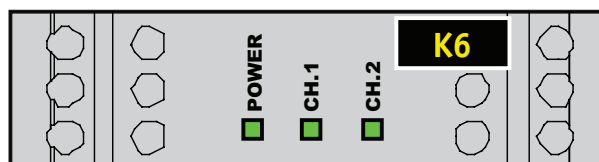
9. Phase guard relay (K7)

	ON
1	Output relay on
2	Output relay on
3	Alarm on: not all 3 phases are present and / or phase sequence is incorrect
4	Power supply on



10. Safety relay (K6)

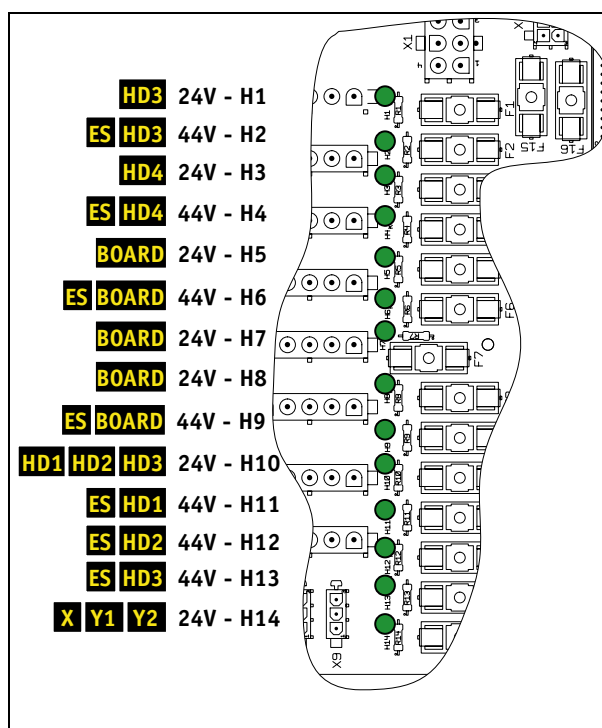
POWER	ON
CH.1	ON
CH.2	ON



11. IBE (interconnection board electrics)

LEDs to be **ON, GREEN**

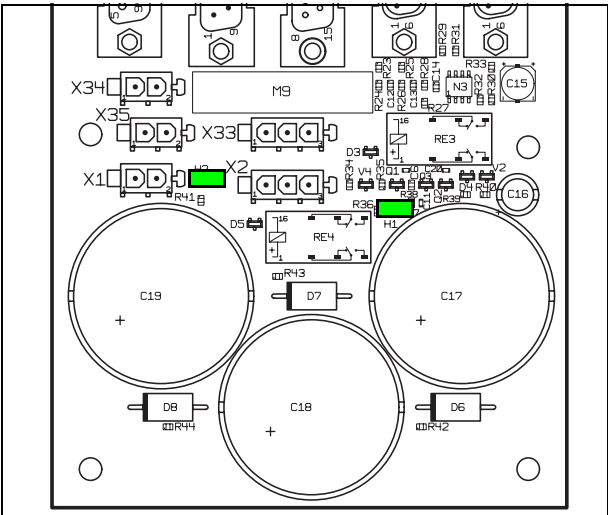
LED		Fuse	Amp.
H1	24V supply PH HA drive 1	F1	4AT
H2	44V-ES supply PH HA drive 1	F2	4AT
H3	24V supply PH HA drive 2	F3	4AT
H4	44V-ES supply PH HA drive 2	F4	4AT
H5	24V supply transport controller	F5	4AT
H6	44V-ES supply transport controller	F6	4AT
H7	24V supply transport controller piggyback	F7	4AT
H8	24V supply transport amplifier	F8	4AT
H9	44V-ES supply transport amplifier	F9	4AT
H10	24V supply head drive 1&2(&3)	F10	4AT
H11	44V-ES supply head drive 1	F11	4AT
H12	44V-ES supply head drive 2	F11	4AT
H13	Spare: 44V-ES supply head drive 3	F13	4AT
H14	24V logic supply Y1+Y2+X	F14	4AT
-	Z-axis PH HA Head 1	F15	4AT
-	Z-axis PH HA Head 2	F16	4AT



12. IBD (interconnection board drives)

LEDs to be **ON, GREEN**

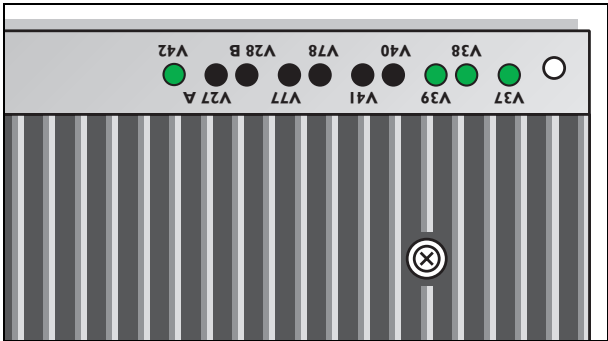
LED	STATUS
H1	Servo power XY robot enabled
H2	Power supply 24V



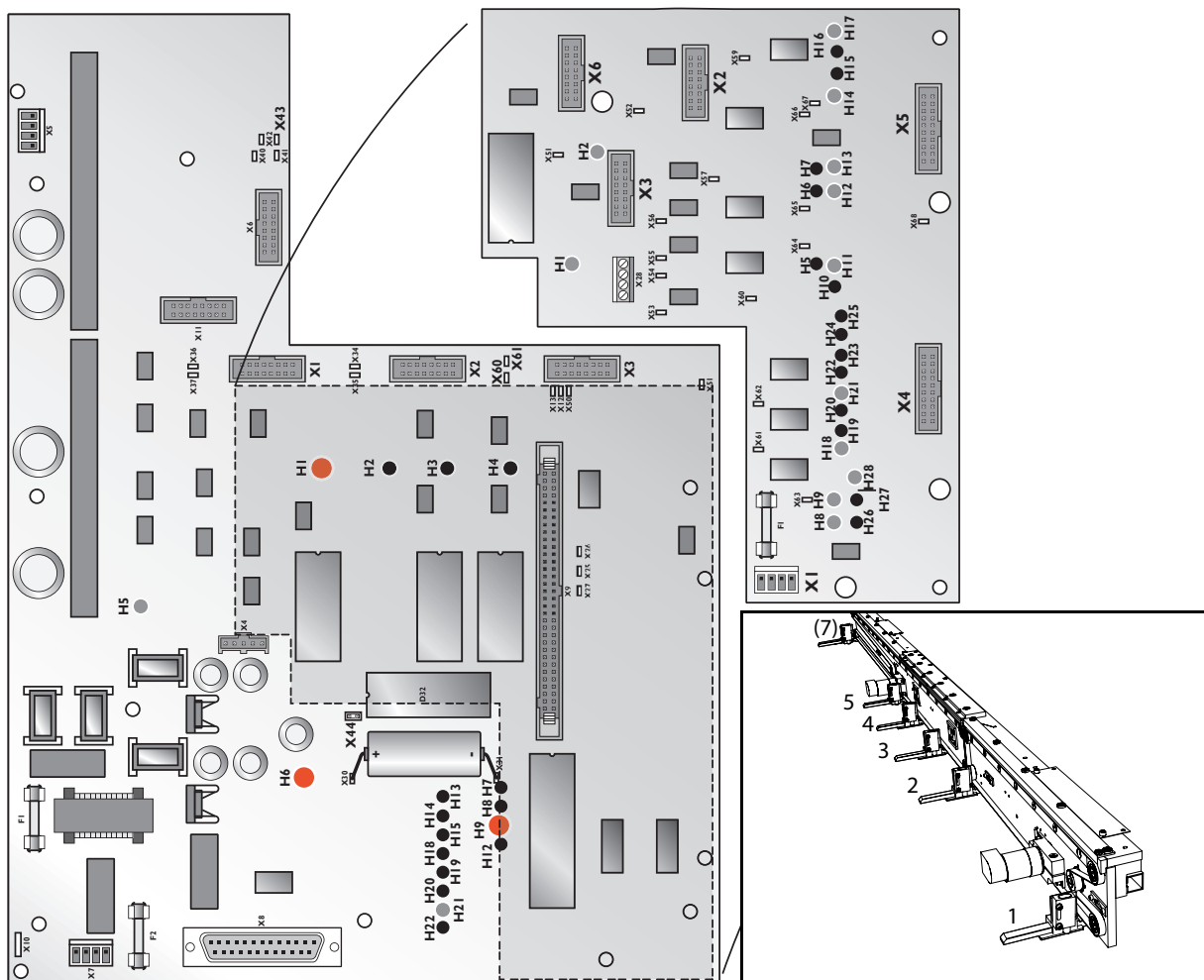
13. Transport amplifier

LEDs to be **ON, GREEN**. Use a mirror.

LED	SYSTEM STATUS
V37	CHOPON (chopper transistor operation)
V38	ENABLE (no error signals)
V39	HSPOK (board in position front)
V42	LSPSOK (low voltage power supply) no error



14. Transport controller

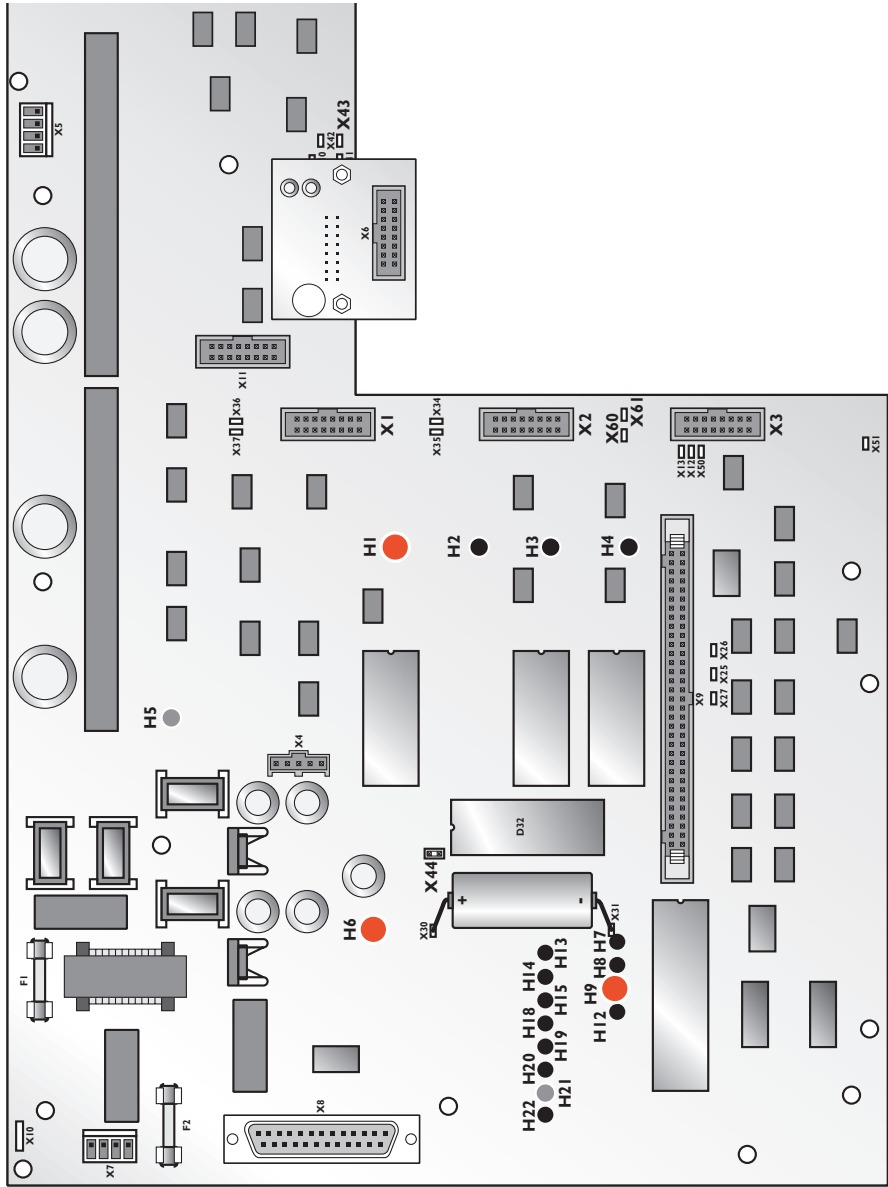


LEDs to be **ON**, **RED**

LED	SYSTEM STATUS	LED	SYSTEM STATUS
H1	Index WA	H6	Servo power OK (45V)
H2	Index Z-lift	H9	Enable controller
H4	Index RI	H21	Enable amplifier WA and RI
H5	24V supply < 16V (power failure)		
Piggy back			
H1	Enable servo power on	H13	Board sensor, WA-IN (3)
H2	Index Width	H14	Z brake
H7	Board sensor, run-out OUT (7)	H17	SMEMA board available
H8	Board sensor, run-in OUT (2)	H18	SMEMA busy
H9	SMEMA previous machine board available	H21	Width brake
H11	SMEMA next machine busy	H28	Board sensor, run-in IN (1)
H12	Board sensor, WA-POS (5)	No LED	Board sensor, WA-LOW (4)

LED checks.fm

15. Placement head HA controllers



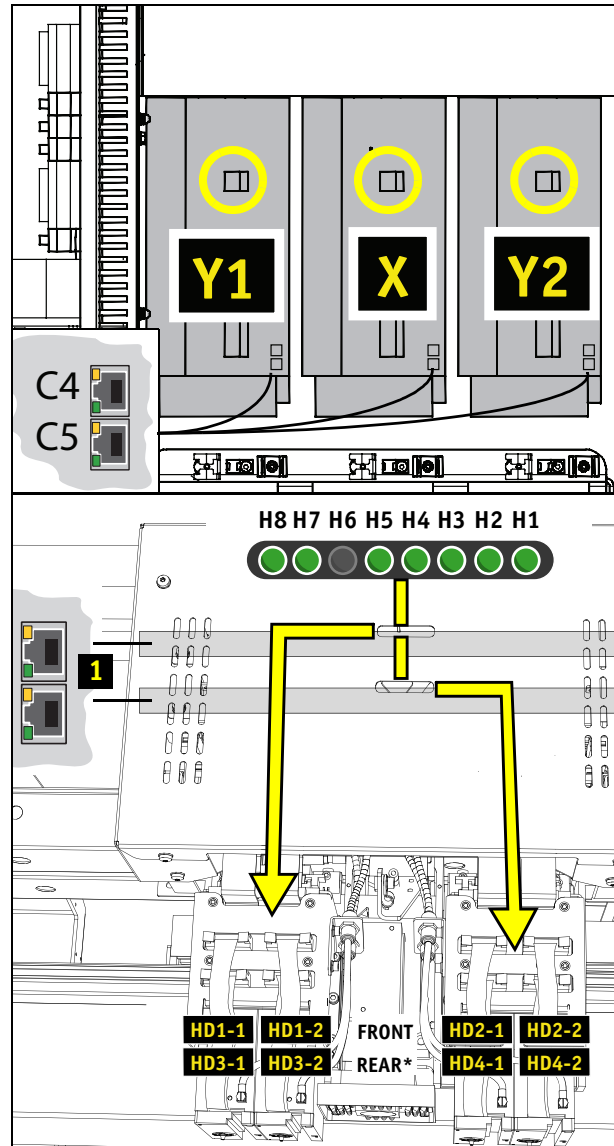
LEDs to be **ON, RED**

LED	SYSTEM STATUS		
H1		H13	Digital output - Select nozzle/grip
H3	Zero fine RZ encoder	H14	Digital output - Vacuum
H4	Zero fine Z encoder	H15	Digital output - Exchange toolbit
H5	24V supply < 16V (power failure)	H18	Digital output - Select analogue
H6	44V supply > 25V (emergency stop)	H19	Digital output - PC busy
H7	Digital input - RZ EPD, zero coarse Z	H21	Digital output - Emergency head control
H9	Digital input - Enable controllers	H22	Digital output - Enable RZ amplifier

LED checks.fm

16. Motion amplifiers XY robot

- The display on each motion amplifier must show '2.'
- Synqnet communication on each motion amplifier C4,C5.
- All green and orange LEDs must be ON.



17. Placement head DV controllers

LEDs to be **ON, GREEN**

LED	CONTROLLER STATUS
H1	Power
H2	Z axis - HDx-1
H3	RZ axis - HDx-1
H4	Z axis - HDx-2
H5	RZ axis - HDx-2
H6	Node alarm
H7	FPGA status
H8	Boot status

* Placement heads DV can be located on HD3, HD4 as well.

- Synqnet communication on each placement head DV controller (1). All green and orange LEDs must be ON.

A5.1.9 Documentation

The service manual provides extended troubleshoot information in several 'troubleshoot' chapters, separated in 'system' and all functional modules of the machine.

Troubleshoot information contains the following main parts:

- Diagnosis trees: guide the user through all necessary checkpoints and actions to solve the problem.
- Diagnosis procedures: descriptions of small, separate steps that are necessary to complete a diagnosis tree.
- Reference information: detailed information, such as
 - Explanation of cable connections
 - Explanation of LED and dipswitch status
 - Etc.
- Diagrams: electrical wiring and cabling diagrams.

The troubleshoot chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.



NOTE: Using the electronic version of the manual will enable the user to use hyperlinks and the 'back' button in the browser to navigate quickly through the information in separate paragraphs.

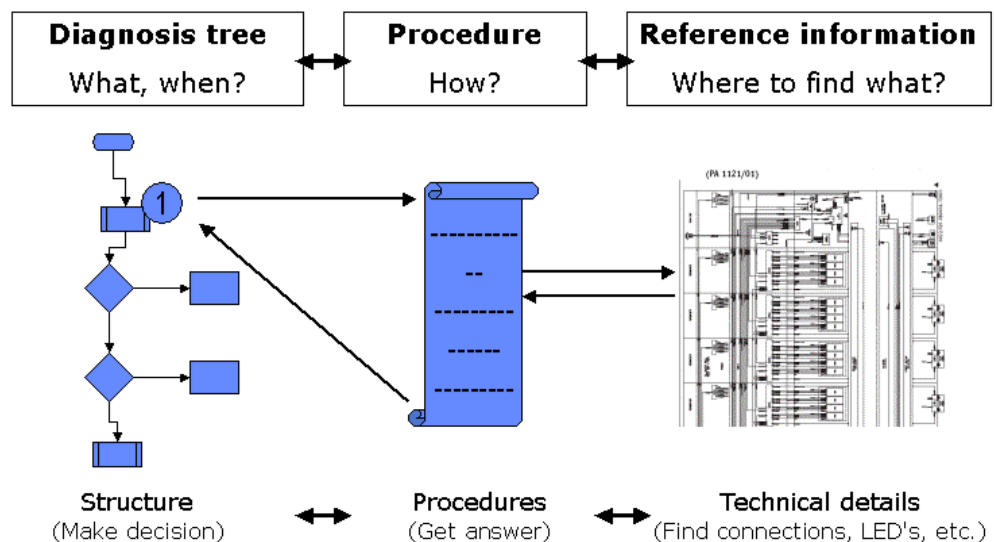


FIGURE 70 Visual structure of chapter 5

A5.1.10 Advanced support

In case of a persistent problem, please inform through regular channels Assembléon development for further support.

To speed up the analysis and generation of the solution Assembléon needs the following information:

- Machine ID or serial number, see [A3.1 Machine identification](#)
- Placement head ID or serial number, see [CHAPTER D3 Technical specification](#)
- Date and time of occurrence.
- Involved placement program (including all shape descriptions).
- Calibration data, see [A5.1.12 Calibration data](#)
- Logging data, see [A5.1.11 Logging](#)
- Error number / problem description.

A5.1.11 Logging

If the Error/Warning screen does not provide enough information to pin point the module that is causing the problem, it may be helpful to check the logging files. Both the system controller (ASC) and the process controller (APC) are continuously logging events.

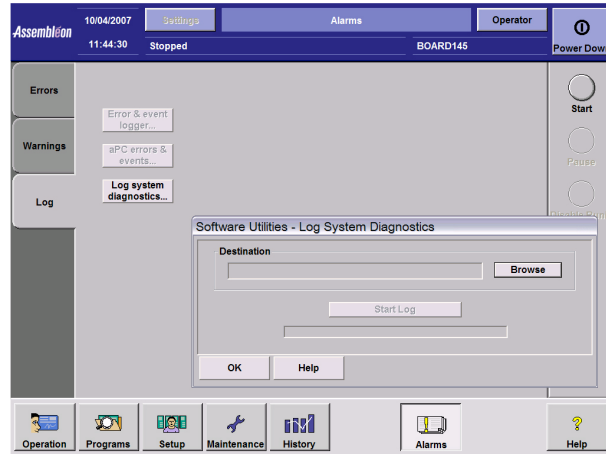


FIGURE 71 Event logging

View ASC log file by clicking on "Display" and "Enable" (aSC>bin>EEL.log)

View APC log file (Data on aPC >work>EEL.log)

After clicking on "Start log", all log files will be saved to the selected location (USB stick), for further investigation.

Insert an USB memory stick in the system controller and browse for that disk.

WARNING: Do not shut down the system before saving the log files, to avoid loss of Vision log data

If a file becomes bigger than 1 Mb, automatically an EEL.old file will be generated. Therefore also old data will be saved.

The log files of the ASC and APC can be saved to a USB stick via the user interface:

This file is called ACMlog.zip.

This file contains:

```
\aPC\work\aPC/*.log
\aPC\work\aPC/*.old
\aPC\state/*.stt
\aPC\syscal/cal.stt
\aPC\config/machine/*
\sc\acm\bin/*.log
\sc\acm\bin/*.old
\sc\orders/*
\sc\config/*
```

A5.1.12 Calibration data

The following files contain machine specific data. The default files with a release must be tuned to fit the machine.

aPC:syscal/ CAL.STT

```
aPC:syscal/ XYTAB_A.DAT
aPC:syscal/ XYTAB_B.DAT
aPC:config/machine/ CAL.CFG
aPC:config/machine/ HDV.CFG
aPC:config/machine/ VSH.CFG
aPC:config/machine/ FDR.CFG
```

In the cal.cfg the nominal numbers of dimensions are declared.

All *.cfg files are the same for all machines. The exception is the hdv.cfg. This file contains machine specific home offsets.

The XYTAB_*.dat files contain the X-Y calibration data which is a result of the XY calibration (with the glass plate) procedure.

Extra logging facilities can be enabled using EER.exe.

In 'tasks and modules' can be determined which loggings to be enabled. All other files are standards concerning a specific subject. Keep in mind that besides the desired loggings, the general logging facility also must be enabled. After diagnosing the problem, it is mandatory to disable the logging. All selected extra logging will be included in the ACMlog.zip (\\asc\c\asc\bin\eel.log
\\apc\d\user\apc\work\eel.log).



NOTE: Logging affects the machine performance

A5.2 Diagnosis trees and tables

A5.2.1 Diagnosis trees, conventions

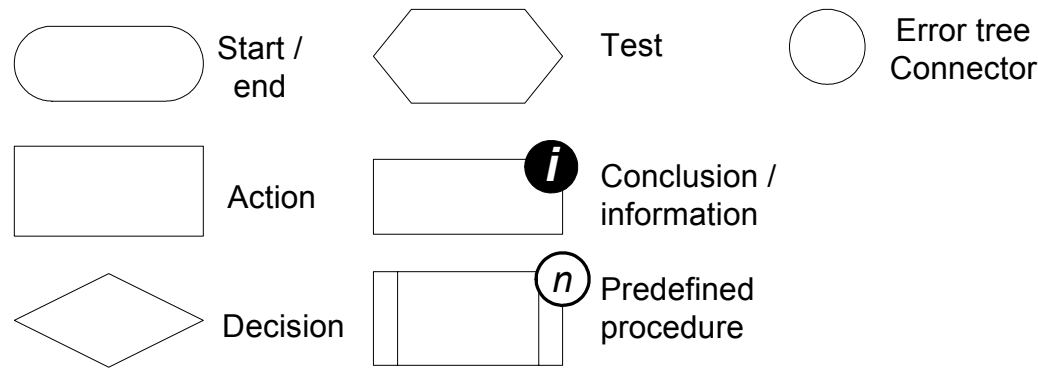
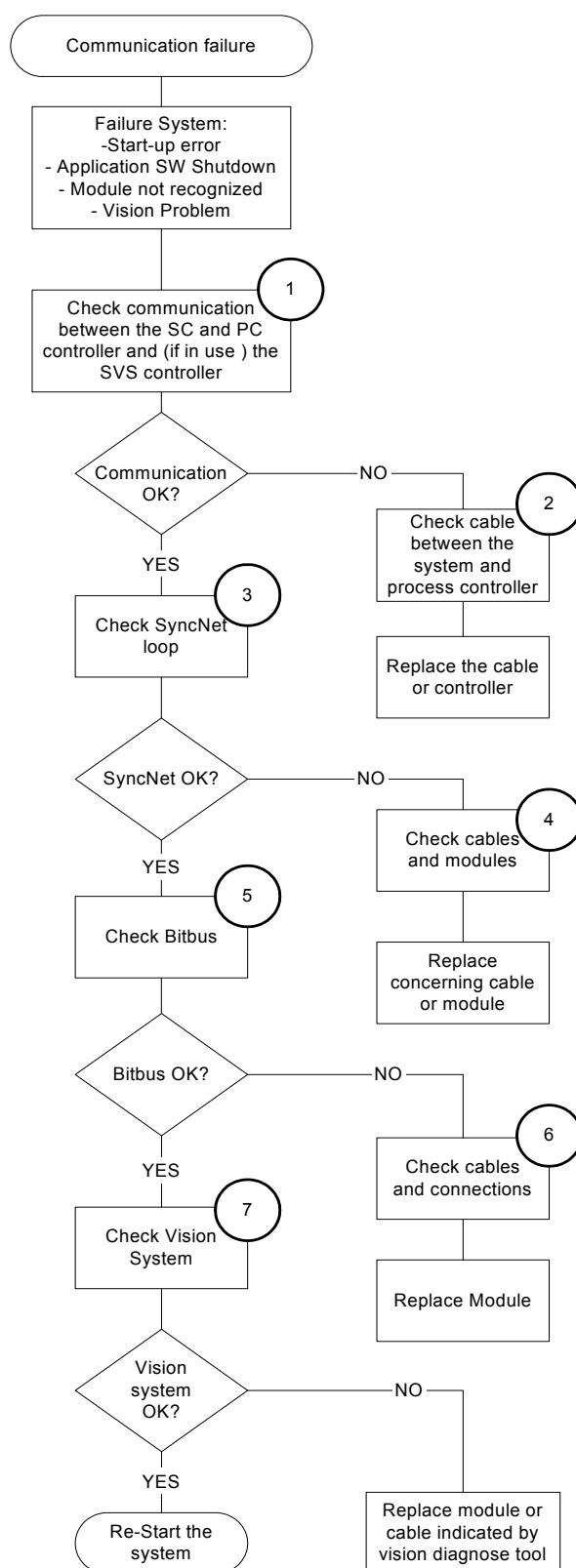


FIGURE 72 *Diagnosis trees, conventions*

A5-00015.fm

A5.2.2 Communication, diagnosis tree



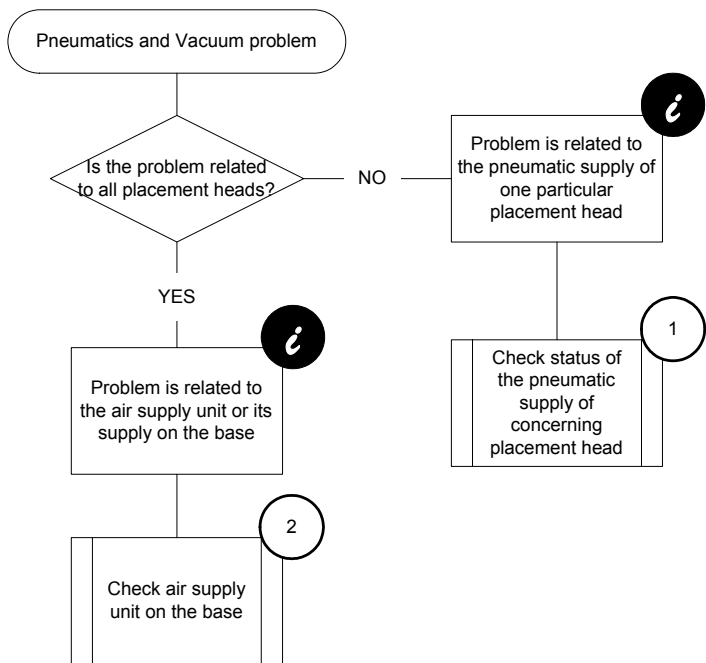
Reference:

1. -
2. B5.3.2 Controllers, connections
3. A5.1.6.2 Synqnet function check
4. A4.4.3 Data communication
5. A5.1.4 Bitbus communication check
6. A4.4.3 Data communication
7. A4.4.3.4 Firewire communication

Figure 73 Communication, diagnosis tree

A5-00002.fm

A5.2.3 Pneumatics and vacuum, diagnosis tree



Reference:

- 1.D5.2.4 Placement heads, supplies problem
- 2.B5.2.5 Air supply unit, diagnosis table

A5-00004.fm

Figure 74 Pneumatics and vacuum, diagnosis tree

A5.3 Diagrams

A5.3.1 Wiring diagrams

A5.3.1.1 Wiring diagram PA2410/01

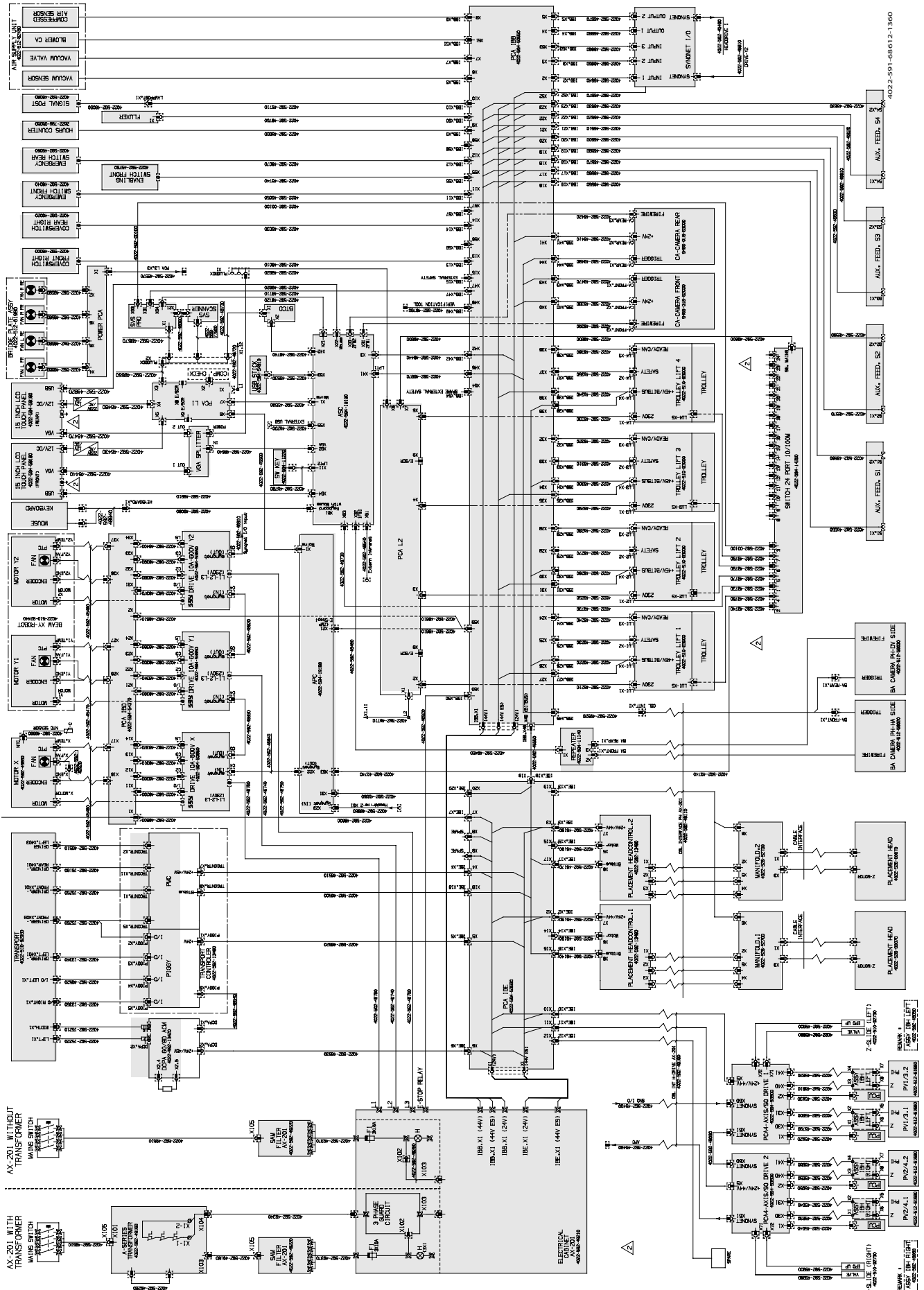


Figure 75 Wiring diagram PA2410/01

A5.3.1.2 Wiring diagram PA2410/00

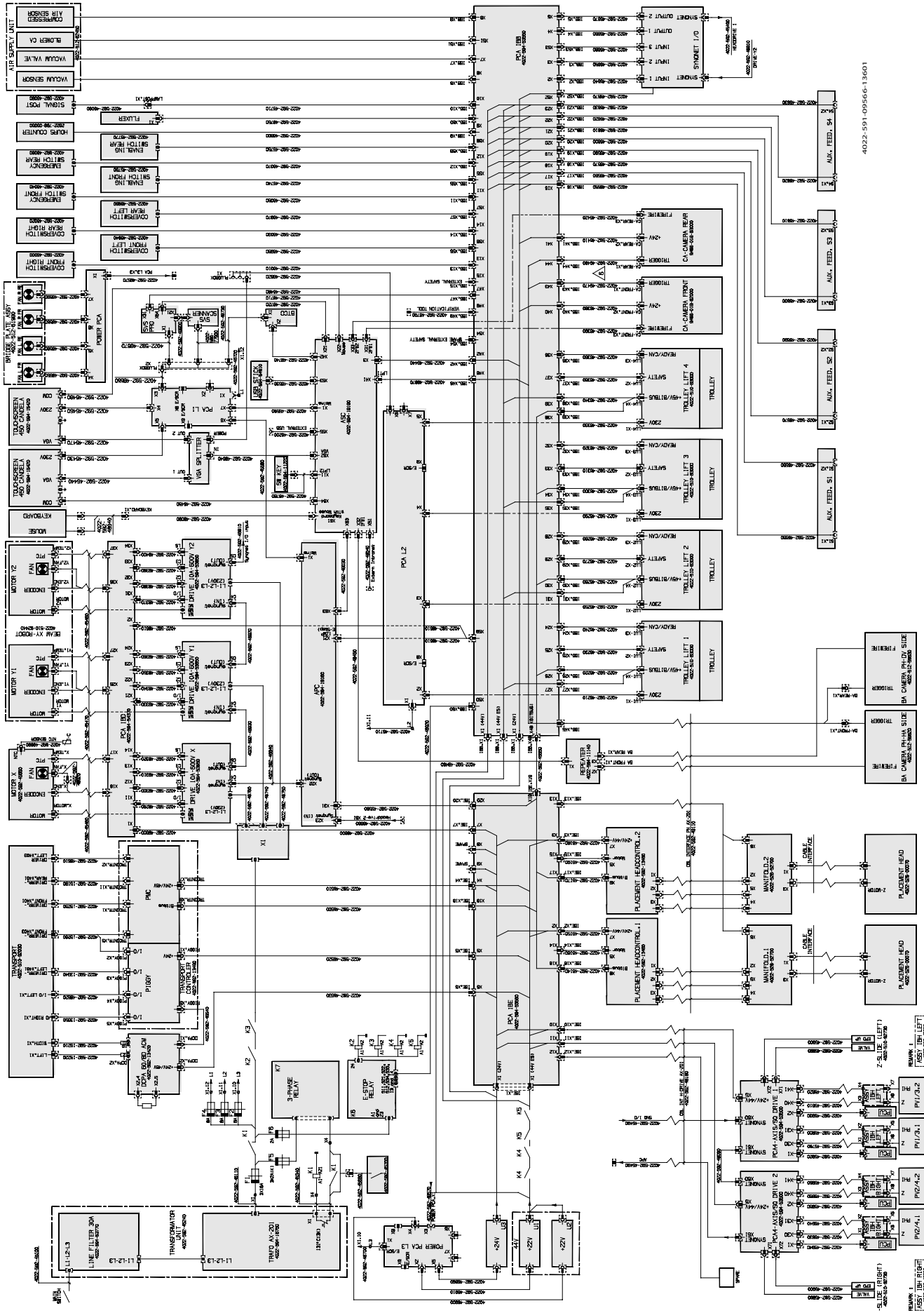


Figure 76 Wiring diagram

A5.3.2.1 Power and safety circuit, PA 2410/01



Assemblée

A5.3.2.2 Power and safety circuit, PA 2410/00

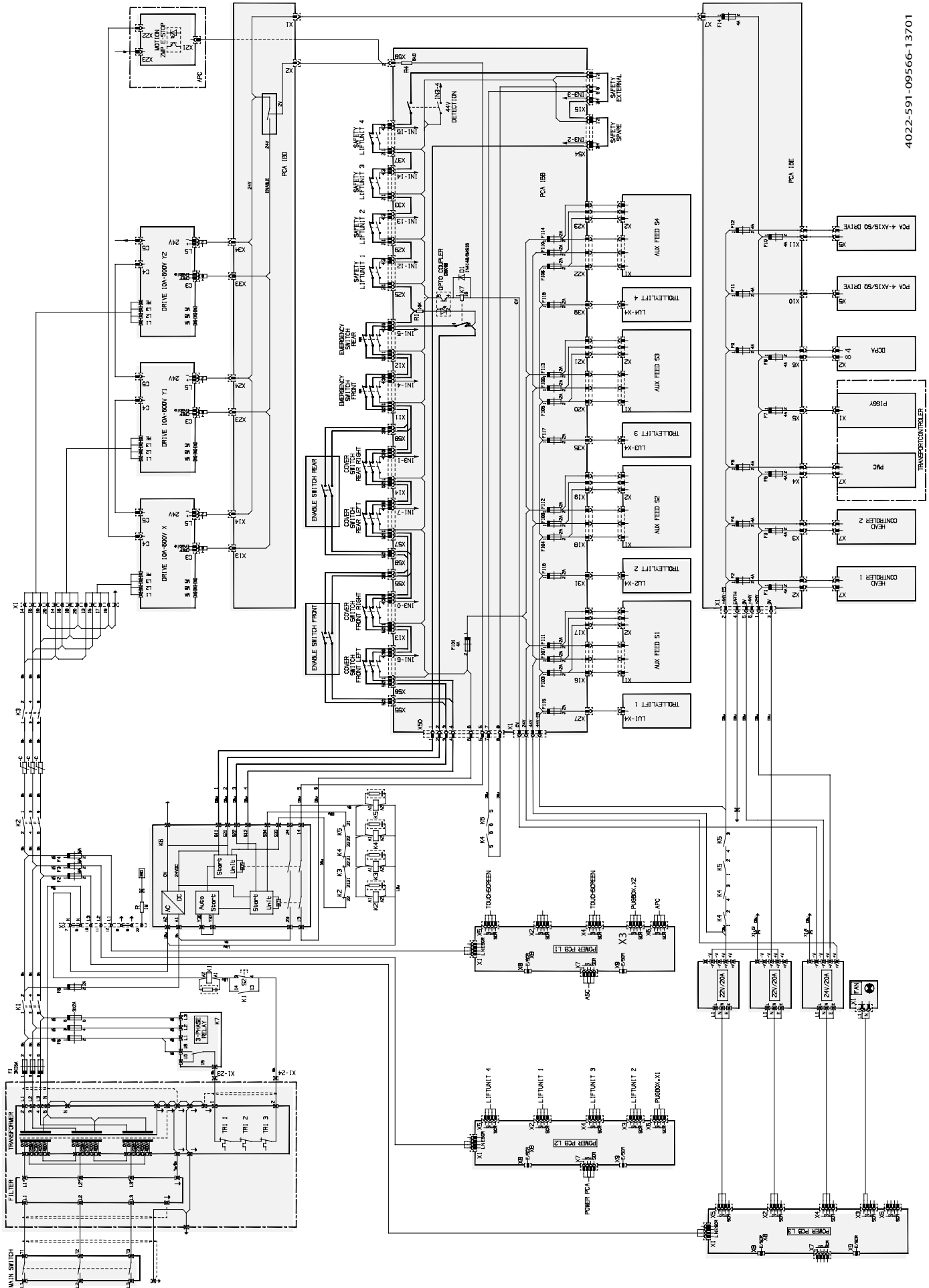


Figure 78 Power and safety circuit

CHAPTER A6 Measurement, adjustment and calibration

A6.1 Module calibrations, overview

The calibration values are stored in the cal.stt file. This file is located on D:\USER\APC\SYSCAL and can also be viewed via the calibration window.

(A - User, 5 - M&S Functions, 4 - Calibration)

The module calibrations are divided in four levels,

■ Exchange calibration

Exchange calibration is used after exchanging (replacing) one of the configured modules.

For calibrating see chapter [A6.1.1 Exchange calibration procedure](#) .

■ Refresh calibration

Refresh calibration is required once every month by the system controller. The system generates a warning on screen after which this refresh calibration has to be executed on a sufficient moment.

For calibrating see chapter [A6.1.2 Refresh calibration procedure](#)

■ Auto calibration

The auto calibration procedure can be used when no module calibration is performed before. In other words no cal.stt file is present on the system.

For calibrating see chapter [A6.1.3 Auto calibration procedure](#)

■ Low level calibration

With the low level calibration all sub calibration steps per module can be selected separately, e.g. for investigation or recalibration.

For calibrating see chapter [A6.1.4 Low level calibration procedure](#)

A6.1.1 Exchange calibration procedure

Estimated time to complete [min.]:

Required special tools. Calibration nozzle for CV and placement heads

Required part(s)

1. Prerequisites

- Login as M&S engineer.
- Select 'Maintenance'.
- Select the concerning module.

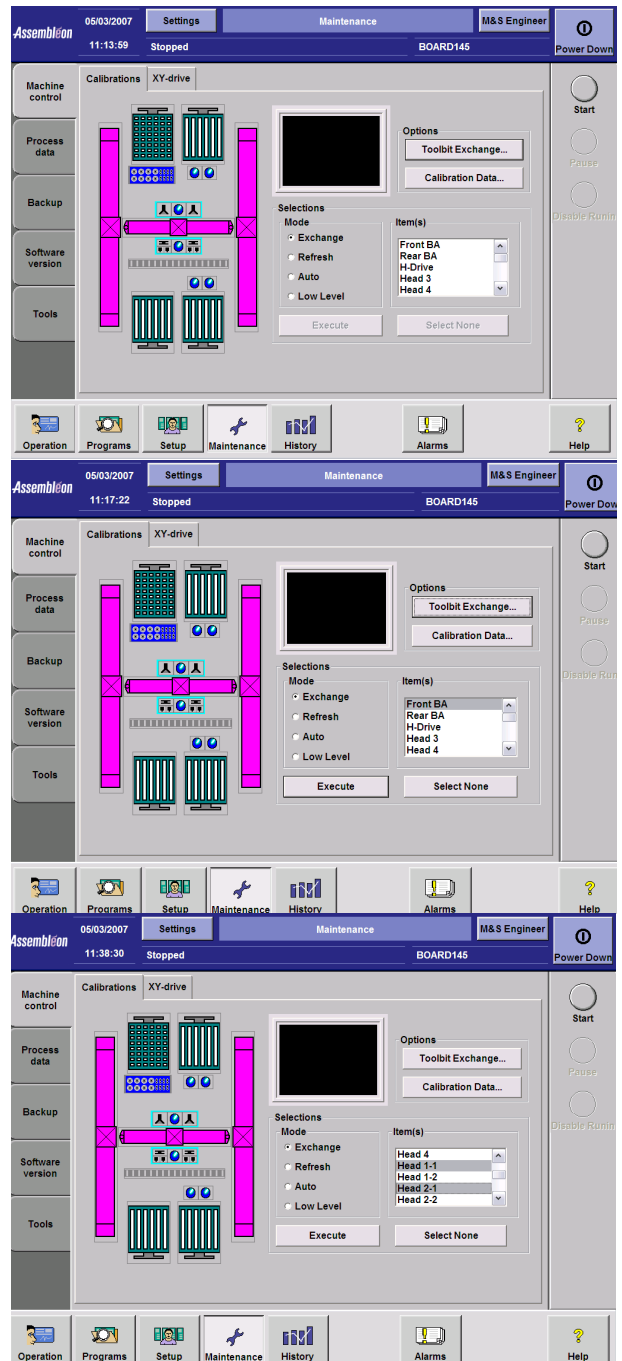
Note: All related calibrations will be performed after selecting it. Below the different sub calibration steps are described for each module.

2. Front BA camera

- Pixel size and camera orientation,
- Head marker,
- XY robot is homing,
- Head/BA relation head 1
- RZ head 1
- Head/BA relation head 2
- RZ head 2

3. HEAD 1 and/or 2 (PH-DV)

- Calibration nozzle
- Z=0,
- Force table,
- Head/BA relation,
- RZ.



4. FEED SECTION 1 and/or 2

- XY position,
- Z level.

5. TOOLBIT EXCHANGE UNIT

- XY position.

6. FRONT CV

- Calibration nozzle
- Head marker,
- XY robot is homing,
- CV Left/Right,
- Head 1 and 2 Z=0,
- CV Transmission and reflection light levels (left and right camera),
- Camera orientation + pixel size,
- Feed sections XY position and Z levels,
- Toolbit exchange unit

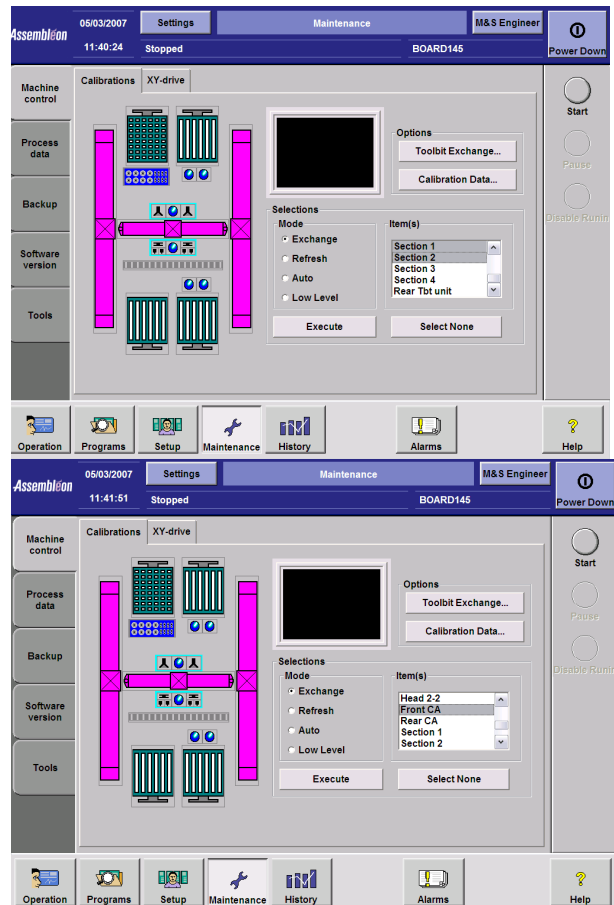
7. Rear BA camera

8. Rear CV camera

9. Rear placement heads (PH-DV or PH-HA)

10. Finalize

- After these steps switch to low level to calibrate the board transport.
See [A6.1.4 Low level calibration procedure](#)



A6.1.2 Refresh calibration procedure

Estimated time to complete [min.]:

Required special tools. Calibration nozzles

Required part(s)

1. Prerequisites

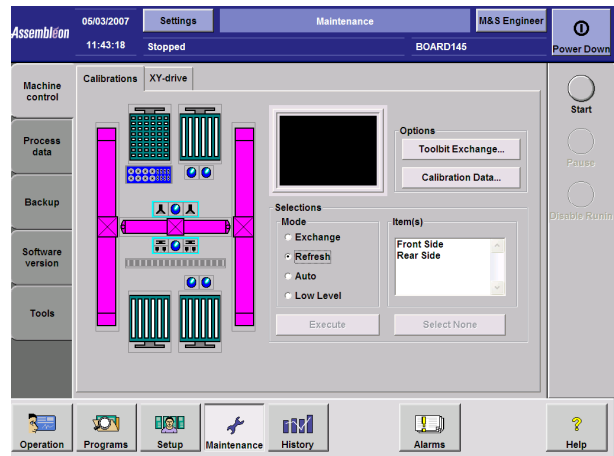
- Select FRONT or REAR side.

2. FRONT

- BA Pixel size and orientation
- Heads 1 and 2 Z=0
- CV camera transmission and reflection light levels
- Head 1 and 2 RZ-Zero/BA camera orientation

3. REAR

- BA Pixel size and orientation
- Front/Rear offset
- Z Level
- CV camera transmission and reflection light levels (left and right camera)



A6.1.3 Auto calibration procedure

Estimated time to complete [min.]:
 Required special tools. Calibration nozzles (2x)
 Required part(s)

1. Prerequisites

- Applicable when no modules are calibrated.

Note: A workaround is to rename the cal.stt file in e.g. into cal.org. The system will automatically generate a new cal.stt file and the AUTO CALIBRATION procedure can be used.

2. FRONT

All configured modules will be calibrated successively:

- BA pixel size and camera orientation
- CV head marker
- The XY robot is homing
- CV Left/Right,
- Z=0 Head1
- Force table head 1
- Z=0 Head 2
- Force table head 2
- CV camera transmission and reflection light levels (left and right camera)
- RZ head 1
- RZ head 2
- Feeder section 1 XY position and Z level
- Feeder section 2 XY position and Z level.

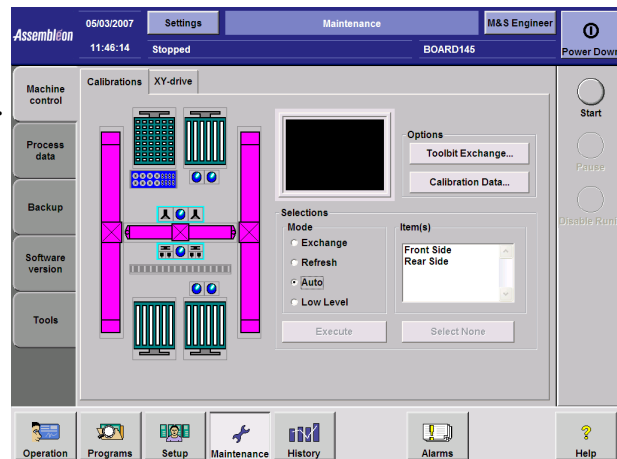
3. REAR

All configured modules will be calibrated successively, e.g:

- CV unit rear
- Flux applicator rear
- Toolbit exchange unit rear
- XY position

4. Finalize

- After these steps switch to low level to calibrate the board transport
 See [A6.1.4 Low level calibration procedure](#))



A6.1.4 Low level calibration procedure

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1. Prerequisites

-

2. FRONT BA

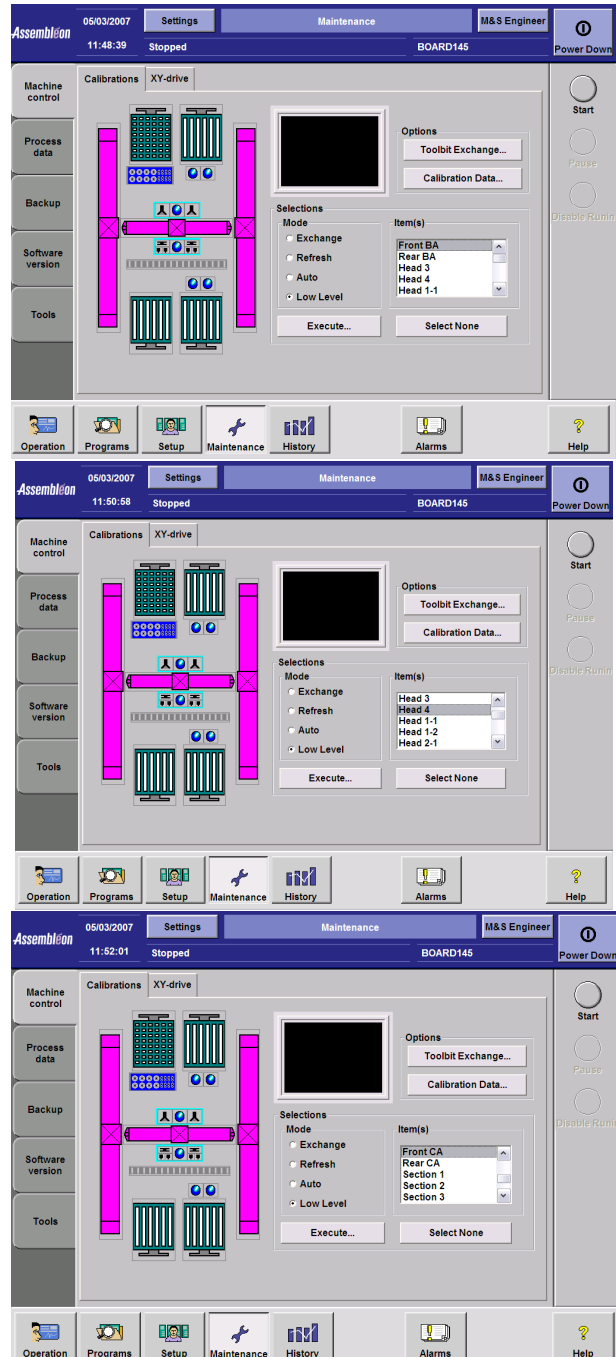
- Pixel size and camera orientation
- Front / Rear offset
- Lightlevel

3. HEADS

- Placement force
- Z zero
- Head RZ zero/BA camera relation.
- Vacuum flow.

4. FRONT CA

- Centre head marker
- BA - CA reference marker relation
- Z - levelSCREEN CLIP
- Left camera orientation and pixel size (reflection light used)
- Right camera orientation and pixel size (reflection light used)
- Left camera light levels (transmission and reflection)
- Right camera light levels (transmission and reflection)



5. SECTION 1 and 2

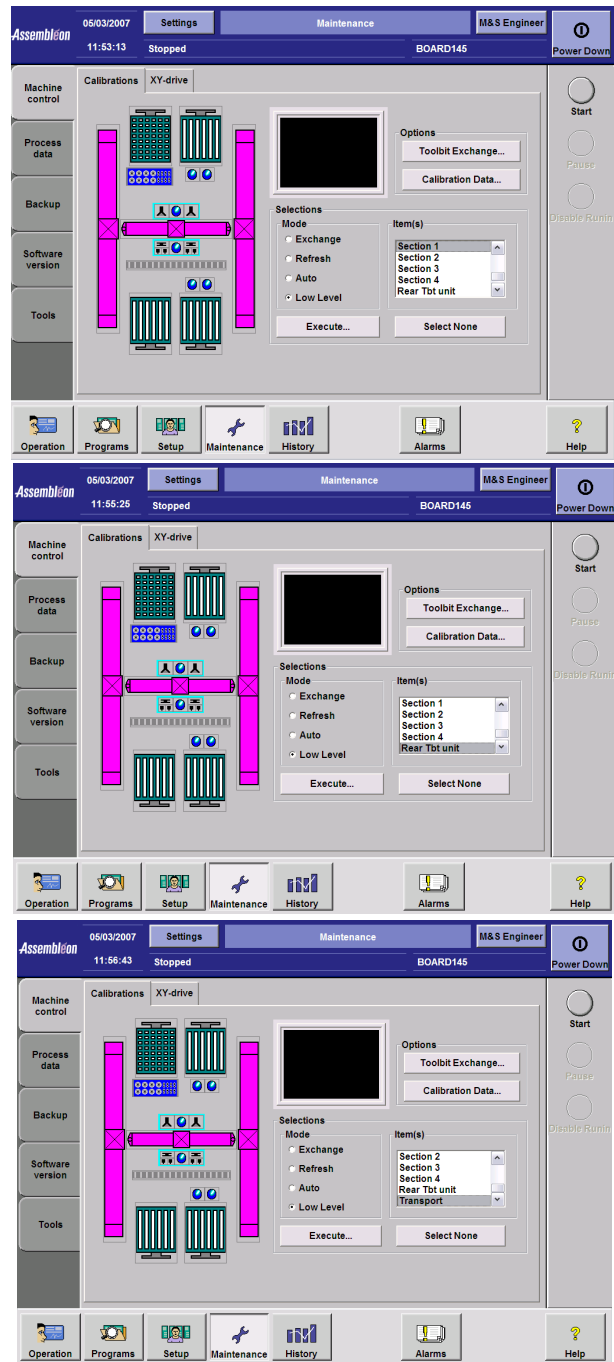
- XY positionP
- Z level

6. TOOLBIT EXCHANGE UNIT

- XY position

7. TRANSPORT

- Transport lift <START>
- Board stop position
- Load board
- After board is positioned press <START>
- XY position
- Z level
- Unload board (Manually remove the calibration plate out of the transport.



A6.2 Close loop calibration procedure

A6.2.1 General

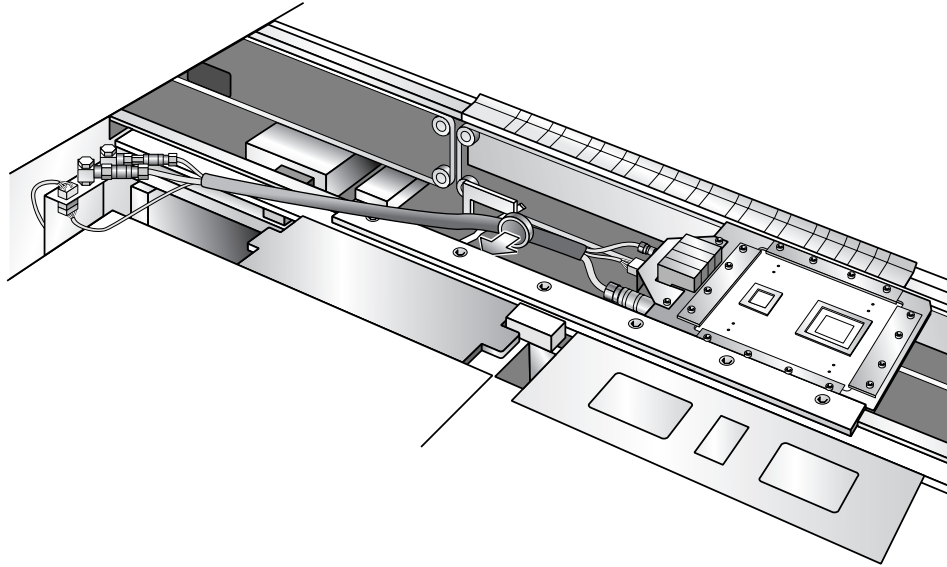


Figure 79 Close loop calibration tool

With this tool the placement accuracy of the machine can be checked and improved. The tool consists of a verification board and a glass component. The software needed for this tool is integrated in the application software of the machine.

On the verification board four place positions are located. The machine will place the glass component on each of the four different positions sequentially.

To secure the position of the glass component after placement, a vacuum is created under the component. When picking the component (after measurement), a blower under the glass component is activated.

To enable verification by the BA camera, the place positions on the board and the glass component have a certain line pattern.

Power and air supply for the close loop calibration tool are provided by the machine.

A6.2.1.1 Verification board

At each placement position a line pattern is etched to enable the measurement of the placement accuracy. Besides the line pattern also several fiducials (local and global fiducials) are etched. The fiducials are to be used in the fiducial alignment calculations of the placement process.

The accuracy of the placement action is measured by comparing the line pattern on the glass plate with the line pattern on the glass component once the glass component is mounted in a regular way. As both line patterns are captured in one image taken by the BA camera, the position of the component relative to the glass plate only depends on the accuracy of the camera and the vision algorithm. This way the accuracy of the measurement is independent of the accuracy of the XY robot.

The two flexible tubes are the air supply for the vacuum and blower created under the glass component. Whether for an individual place position on the board a vacuum or blower is activated is controlled by four valves (one per place position)

which on their turn are controlled by electrical signals supplied by the electrical cable.

A6.2.1.2 Glass component

The glass component is a small rectangular glass plate with an etched line pattern. Due to the transparency of the glass and the non-transparency of the etched lines, the glass component acts as an ideal component. During the component alignment action (in transmission mode) the lines are interpreted as leads of a component. The image of the big glass component corresponds to a QFP160, 0.65 mm pitch.

The image of the small glass component corresponds to a flip chip with 0.150 mm square diameter bumps on a 0.300mm pitch in a 21 x 21 grid pattern.

To store the glass component before and after the verification measurement, one special storage position is available on the board.

A6.2.1.3 Software

The software for the CLC is integrated in the application software.

The application software provides:

- Functionality to execute the measurements.
- Functionality to generate the reports.
- Functionality to store data files on a floppy.
- Several verification placement programs.
- Component files for the glass components.
- Fiducial vision file for the fiducials on the verification board.

A6.2.1.4 Placement programs for clc tool

The following placement programs are available:

Name of placement program. F = Fine pitch C = Chip Scale Package SLS = Single Sided	Relation of head and camera	Placement angle of component	Camera unit
VT1_1_F.ASP	Head 1 – Cam 1	0°, 90°, 180° and 270°	CA LFOV
VT1_4_C.ASP	Head 1 – Cam 4	0°, 90°, 180° and 270°	CA SFOV
VT1_4_F.ASP	Head 1 – Cam 4	0°, 90°, 180° and 270°	CA LFOV
VT2_2_F.ASP	Head 2 – Cam 2	0°, 90°, 180° and 270°	CA LFOV
VT2_3_C.ASP	Head 2 – Cam 3	0°, 90°, 180° and 270°	CA SFOV
VT2_3_F.ASP	Head 2 – Cam 3	0°, 90°, 180° and 270°	CA LFOV
VT_SLS_F.ASP	Head 1 – Cam 1 + Head 2 – Cam 2	0°, 90°, 180° and 270°	CA LFOV
VT_SLS_C.ASP	Head 1 – Cam 1 Head 2 – Cam 2	0°, 90°, 180° and 270°	CA SFOV
VTFRNT_F.ASP	Head 1 – Cam 1 + Head 4 – Cam 1 Head 2 – Cam 2 + Head 3 – Cam 2	0°, 90°, 180° and 270°	CA LFOV
VT_SSOL.ASP	Head 1 – Cam 4 Head 2 – Cam 3	0°, 90°, 180° and 270°	CA SFOV
VT_SSLL.ASP	Head 1 – Cam 1 + Cam 4 Head 2 – Cam 2 + Cam 3	0°, 90°, 180° and 270°	CA SFOV
VT_SSO.F.ASP	Head 1 – Cam 4 Head 2 – Cam 3	0°, 90°, 180° and 270°	CA LFOV

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VT_SSFF.ASP	Head 1 – Cam 1 + Cam 4 Head 2 – Cam 2 + Cam 3	0°, 90°, 180° and 270°	CA LFOV
-------------	--	------------------------	---------

Figure 80 Selection possibilities

A6.2.2 The verification measurements

The output of the verification tool consists of measurement sets. These measurement sets contain the results of the verification measurements, from which the accuracy of the placement process can be retrieved. The measurement sets are available in several ways.

The verification set allows verification measurements on four different locations on the verification board. These locations are separated ± 136 mm from each other.

The offsets are calculated taking the average of the four positions per angle. Per head and CA-camera combination must be runned a minimum of 30 placement cycles (default no. of cycles = 30). One cycle consists of the placement of the glass qfp in a 0, 90, 180 and 270 degrees rotation at position 1, 2, 3 and 4. Pre-defined placement program files are available to run the different cycles.

In this way the accuracy can be obtained of 30um at 4 Sigma for flip-chip applications. Without using the CLC the machine accuracy is 60 -65 um after normal module calibrations.

A6.2.2.1 The measurement set presentation

The presentation of the measurement results is part of the application software. The application software provides facilities to store and archive the measurement sets. Furthermore it provides generation of the following textual and graphical reports:

A6.2.2.2 Summary report

The summary report lists the measured deviations in Xlead and Ylead (mean (μ) and standard deviations such that $|\mu| + 4s$ (total accuracy) corresponds to 30 PPM). For each deviation the average value and the spread is so that $4s$ corresponds to the reliability interval for 30 PPM is given.

Beside that the measured deviations are judged and a pass/fail value is reported too.

A6.2.2.3 Measurements

For each head two different graphs show the individual measured deviations, one graph for Xlead and Ylead each. As these graphs show each individual measurement, they show the stability of the measurements. For the measurement report the maximum number of measurements per head is set to 200.

A6.2.2.4 Histogram

For each head two different barcharts show the measured deviations, one graph for Xlead and Ylead each. These barcharts show the distribution of the measurements.

A6.2.2.5 Head offsets

For each head two values show the head offset. The used value shows actual value in the placement program. The proposed value shows the offset. With a 'change offset' a closed loop calibration (CLC) can be performed. As soon as the 'Change offset' command is entered, an asterisk appears in the CLC column of the summary report. When the offset is '0', no asterisk appears.

Possible head - camera combinations in calibration file:

Name off offset	Description	Remarks
HEAD1_CA1_0	Placement offset for Head 1-Camera 1 relation in 0° rotation.	Also for 90°, 180°, 270° (for 90° the Name = HEAD1_CA1_90)
HEAD1_CA4_0	Placement offset for Head 1-Camera 1 relation in 0° rotation.	Also for 90°, 180°, 270°
HEAD2_CA2_0	Placement offset for Head 1-Camera 1 relation in 0° rotation.	Also for 90°, 180°, 270°
HEAD2_CA3_0	Placement offset for Head 1-Camera 1 relation in 0° rotation.	Also for 90°, 180°, 270°

Figure 81 Placement offsets

A6.2.3 The measurement data files

To use the results of the verification measurements for calibration purposes, the application software provides the functionality to update the head-offset calibration values automatically (per head one value for all rotations).

The application software can store the measurement sets on a floppy disc. These measurement sets can be used for off-line analysis. In the data files (one measurement set corresponds to one data file) all measured deviations (eight per measurement,) are available. The data format of these files is a header with information about the measurement conditions followed by a tabular format containing columns for:

- Head number (1, 2);
- Board position (1, 2, 3, 4);
- Component orientation (0, 90, 180, 270);
- Side identification (N(orth), E(ast), S(outh), W(est));
- Measured deviation in X-direction (MCS);
- Measured deviation in Y-direction (MCS);
- Measured average pitch (MCS);
- Measurement status.

The header contains the following information:

- File name;
- Date;
- Time;
- Order;
- Placement program;
- Number of measurements;
- The head offset per head during the verification run.

A6.2.4 Verification, preparations and requirements

The following preparations and requirements must be met before the verification:

1. Requirements

- Verification tool;
- Glass components;
- Nozzle 04 (large glass component);
- Nozzle 03 (large glass component);
- Nozzle 02 (small glass component);
- Nozzle 01 (small glass component);
- Placement program.

2. Preparation

- Make sure that the following items are clean and dust free:
 - * Heidenhain ruler;
 - * CA SFOV Glass plate;
 - * Verification tool;
 - * Flip chip.
- Make sure the placement system is calibrated.

3. Checklist and adjustments

- Check that the blower pressure is 2.5 ± 0.2 bar.
- Check the gain calibration in the CAL.STT file.
Make sure that the value is between 70 and 80.
- After detaching the component from the nozzle, the rubber must be pushed back on to the nozzle by hand so that it sits straight.
- Select the placement head HA 2 head in the configuration.
- Make sure the board is properly tightened;
use extra bench hooks when necessary.
- Make sure that all feeder sections are filled.
- Create an order.

Note: If a nozzle 01 or 02 is used, the placement program should be modified manually

- Parts of the placement program to be modified are:
 - [setup]
Toolbit 01I* HD or
Toolbit 02I* HD
 - [component tooling]
Nozzle 01I* Outer or
Nozzle 02I*
- For detailed information [setup] block see User Reference Manual, chapter 7.11
For detailed information [component tooling] block see User Reference Manual, chapter 7.9.
- Give order name for MIS period;
- Select placement program;
- Select unlimited boards;
- Confirm with the OK key;
- The order state is now inactive, by means of [start] the order is activated;
- The screen shows the state DEFAULT after the order.

4. Set transport to SMEMA OFF

5. Verify setup

- Programs
- Order setup
- Verify Feeders (no feeders are necessary);
- Verify Transport;
- Verify Toolbits;

Note: The machine is now ready to carry out the verification test.

A6.2.5 Verification test

Estimated time to complete [min.]: 30
 Required special tools. A8.4.14 Verification module, spares
 Required part(s) -



NOTE: Remove at least one trolley before accessing the work-area.
 This makes for easier access to the work area.

1. Prerequisites

- Select in the Human Interface:
- c Production
- 1 Start.

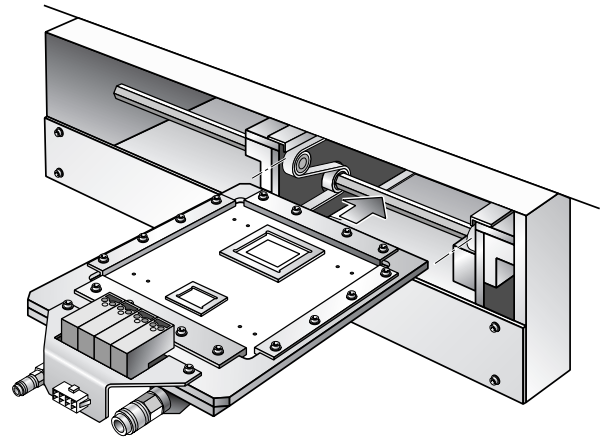
Note: The machine now carries out the homing action and the transport starts running. In the meantime the white lamp remains illuminated.

2. Feed the verification tool

- The tool is transported further and will be clamped in the Work area.

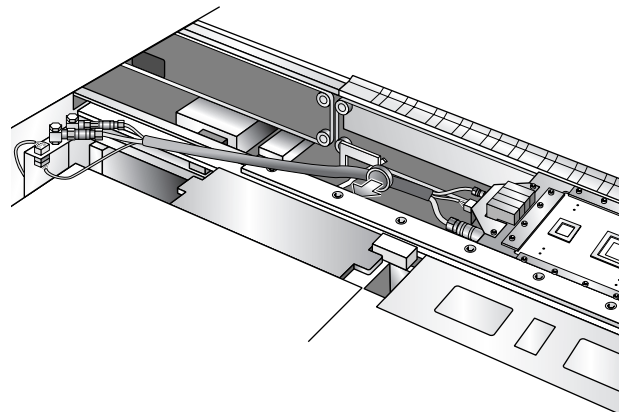
Note: The machine will stop and an error message will be displayed "verification board not connected".

- Move the XY robot to the other side.



3. Connect the verification tool

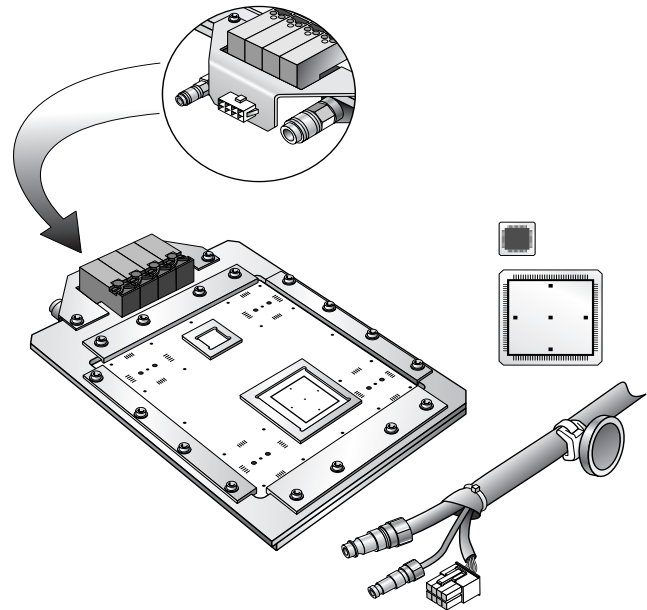
- Open the front cover and connect the tubes and electrical connector at the verification tool. (connect the thick tube first).
- Put the magnet at the front transport rail.
- Note that the tubes and wiring can not be sensed by the board sensors, and XY robot cannot touch tubes and wiring.



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4. Connect verification tool to machine

- Connect the tubes and electrical connector to the machine.



5. Start verification, head 1

- Put glass component in pocket on the board (do not touch glass surface) (if not already there) (shiny side up)
- Close the cover.
- Start verification test by pressing the <start> button on the touch screen.

Note: The error message “the verification board must be connected” still exists.

- Press <retry> and the verification test will start.

Note: The verification test with 480 verification measurements (30 measurements per board position (4 positions), and per angle (4 angles)) with one head takes approximately 45 minutes.
When the verification test is finished, the machine will stop automatically and error messages “Verification board still connected” and “Cannot transport verification board” will be displayed.

- When per placement head a test has to be performed follow the following instructions otherwise continue [7. Remove verification tool](#).

6. Continue verification, head 2,3...

- Stop the active order and create a new order for another head.
The tubes and wires have to be disconnected and the verification tool can be shifted manually out of the transport system.
- Solve the error.
- Remove the order.

Note: When the last placement head has finished the verification test (2 error messages will be displayed again), move the XY robot to the other side.

7. Remove verification tool

- Open the front cover.
- Disconnect the tubes and electrical wire at the machine.
- Disconnect the tubes and electrical wire at the verification tool and remove the magnet from the front transport rail.

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- Remove component from pocket on the board (optional) and shift manually the verification tool out of the machine.
- Close the front cover.
- Solve the error.
- Remove the order.

8. Handling measurement data

Note: The data of the verification test will be sent from apc to the SC. This data can be copied to archive or floppy.

- The data can be presented on screen.
- Select the required run and a summary can be presented.
- The machine accuracy can be improved when the offset is chosen at the head offset menu.
- The calibration data of the machine will now automatically be updated.
- After this improvement the production may start immediately. (The machine does not need a shut down action first).

Note: When major repairs are carried out (involving removal of module from machine) (to ca, ph, transport or XY robot), These offsets become invalid (they can even make things worse). At an exchange ca or head calibration these parameters are automatically reset. At other modules they are not! The user must keep watch for this. If you still want to use this offset again (after such a repair) the verification tool must be run again.

A6.2.5.1 Verification tool, cleaning

Estimated time to complete [min.]: 3
 Required special tools: -
 Required part(s) Fibre free tissue; Ethanol



IRRITATING SUBSTANCE

Direct contact may cause irritation of the skin.
 Avoid direct contact. Use Personal Protection Equipment.



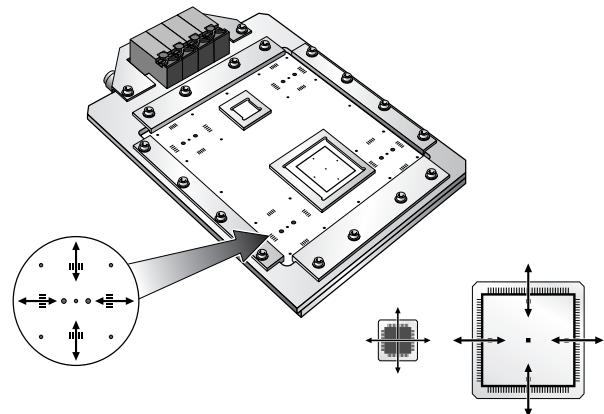
NOTE: When lubricating or cleaning with ethanol, make sure to wear gloves to avoid skin contact.

1. Clean the glass plate

- Clean the glass plate in shown directions using fibre free tissue and Ethanol;
- Inspect the glass plate for damage and severe scratches, replace where necessary.

2. clean the glass components

- Clean the marker plate in shown directions using fibre free tissue and ethanol;
- Inspect the glass plate for damage and severe scratches, replace where necessary.



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A6.3 Software licences, adjusting

Estimated time to complete [min.]:

Required special tools.

Required part(s)



NOTE: Because the software licence hardware key is specifically programmed or each licence combination, communication with Assembléon is an important part of this procedure.

For an overview of available licenses, see [A4.3.7.3 Hardware keys](#)

For replacing a **defective** software licence hardware key refer to [B8.10 Software licence hardware key, replacement](#)

1. Prerequisites

- This procedure is only applicable when updating the software licences (adding more licences).

2. Adjusting the software license

- Log in as M&S engineer.
- Set the machine in idle state.
- Select 'Maintenance'.
- Select 'Tools' - 'Licence tool'.
- Select 'Get Locking Code' (1).
The locking code appears in the top field.
If the message "Error" appears in the top field, make sure the key is firmly attached to the system controller and try again.
- Select the 'Save' button (2) to save the locking code to file.

Note: Use the PA and DC number of the machine for the file name. (for the location of the identification sticker see [A3.1 Machine identification](#) .

3. Activating a software license

Note: To activate a software license(s) on an existing machine, a license update code has to be ordered first. This code is sent as file and is only applicable for the machine it was requested for. The received license update code will cover all ordered licenses.

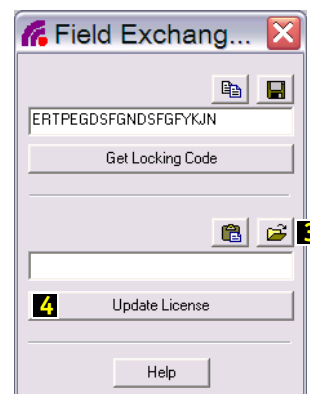
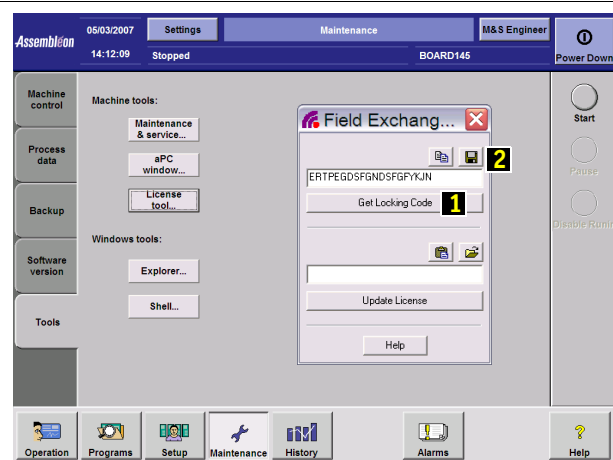
- Make sure the license update code file is available on a memory stick.
- Log in as maintenance and service engineer
- Select 'Maintenance', 'Tools' and 'Licence tool'.

Note: This procedure can be done while the machine is in idle state.

- Select the 'Open' button (3) and browse to locate the software update license code file on a memory stick in the system controller.
- Select 'Update License' (4).

Note: The hardware key programming begins; it may take up to two or three minutes to complete. Note that license update codes can only be used once.

- When "Update Successful" appears, close the field exchange utility.
- Verify that all required licenses are available on the screen.



CHAPTER A7 Maintenance schedules

This chapter lists all preventive maintenance aspects of the machine, completed with recommended intervals and references to the actual procedure.

A7.1 Recommended maintenance tools and materials

Recommended maintenance tools and materials can be found in:

- [A8.6 Tools](#)
- [A8.5 Materials](#)

A7.2 Maintenance intervals, calculation

All data on recommended maintenance intervals and total service time are based on following starting points:

- Production time 20 hours a day;
- Environmental operating conditions as specified in the Installation Manual (e.g. temperature, humidity, dust etc.);
- Full option configuration.

Keep in mind that a number of extra factors will affect actually needed maintenance intervals, e.g.

- Deviating environmental operating conditions;
- Component's quality;
- Tape material's quality;
- The use of glue/ solder paste;
- Oil contents of compressed air.

A7.3 Preventive maintenance schedule

Item		Operator		Engineer	
Base	Time	Weekly	Monthly	6 Months	Yearly
B7.1 Touch screen and keyboard, cleaning	2	★	★	★	★
B7.2 Protection hoods, cleaning	5	★	★	★	★
B7.3 Safety contacts on front and rear cover, checking	2	★	★	★	★
B7.4 Air supply unit, draining	5	-	★	★	★
B7.5 Filter in controllers, replacement	2	-	-	★	★
B7.6 Filter in air supply unit, replacement	10	-	-	★	★
B7.7 Gauges on air supply unit, checking	2	-	-	-	★
Board transport					
C7.1 Board sensors, cleaning	2	-	★	★	★
C7.2 Transport area, cleaning	5	-	★	★	★
C7.3 Transport spindles and bearings, checking and lubricating	30	-	-	★	★
C7.4 Transport belts, checking	10	-	-	★	★
Placement heads					
D7.1 Toolbit exchange unit, cleaning	2	-	★	★	★
D7.2 Component reject module, cleaning	2	-	★	★	★
D7.3 Nozzles interface, checking cleaning	10	-	★	★	★
D7.4 Placement head DV, cleaning the air channel	15	-	-	-	★
D7.5 Placement head HA, replacing the dust catch filter in flip chip nozzle	3 per nozzle	-	-	★	★
D7.6 Placement head HA, replacing the dust catch filter in nozzle	5 per nozzle	-	-	★	★
D7.7 Placement head HA, replacing the carbon brushes from Z and RZ motor	10	-	-	-	★
D7.8 Placement head DV and Z-lift, checking, cleaning and lubricating	60	-	-	-	★
D7.9 Placement head HA, checking, cleaning and lubricating	20	-	-	-	★
Vision					
F7.1 CV camera, cleaning the external waste bin	2	★	★	★	★
F7.2 Vision markers on CV camera, cleaning	5	★	★	★	★
F7.3 BA camera, cleaning	2	-	★	★	★
F7.4 CV camera, cleaning the glass plate	15	-	-	-	★
F7.5 CV camera, cleaning the internal waste bin	2 or 20	-	-	★	★
XY robot					
G7.1 Linear scales on XY robot, cleaning	2	-	-	★	★
G7.2 Linear guides on XY robot, cleaning and lubricating	30	-	-	★ ¹⁾	★
G7.3 Fans on X axis, cleaning	20	-	-	★	★
G7.4 Fans on Y axis, cleaning	30	-	-	★	★

1) Lubricate the linear guides **every 2 months**.

CHAPTER A8 Spares tools and materials

This chapter provides information on spare parts, tools and materials used to perform preventive and corrective maintenance, machine installation or re-configuration. Prices and standard packing units are not included. Please consult your regional service centre for price information.

- Repair policy, see [A8.1 Repair policy](#) .
- Spares, see [A8.3 Spares](#) .
- Materials, see [A8.5 Materials](#) .
- Tools, see [A8.6 Tools](#) .

A8.1 Repair policy

During the first year after introduction of this machine some replaced parts are expected to be send back for investigation:

- Interface board base
- Interface board electrics
- Dual vision placement head controller
- System, process and SVS Pro controllers.
These controllers can only be replaced as a whole module for the time being. After one year the need of spare parts in this module will be defined.
- Send back the part(s) in the original packaging.

A8.2 Decommissioning policy

The following items can become solid waste after use:

- Printed circuit boards
- Transformers
- Automatic fuses / motor switches
- Batteries
- Lamps
- Relays /contact elements.

After decommissioning, more than 80% of the machine can be recycled. Some parts become solid waste.

Disposal of solid waste should be done in accordance to local legislation. This differs per country.

A8.3 Spares

A8.3.1 Spares, definitions

- Item number Four digit number to identify the spare part in this manual, consisting of a two digit module number and a two-digit sequential number for each spare part.
- Part of item If a spare part is a part of a higher assembly, part of item shows which assembly.
- Ordering code. . . . The code number with which the spare part can be ordered at your regional service center;
- Description Name of the spare part.
- Qty/ mod The number of times the part is used within the module or machine. When this field is left empty the item either equals the module or the item is not directly related to the machine configuration.
- Priority Indicator . . A part can be a priority spare part, meaning it is of vital importance for running the machine. If a spare part is a priority spare part, it will be declared as "Y", otherwise a "-" is shown.
- Repair options . . . 'RO': The defective item is replaced (swapped), after sending it back, by a part with equal form, fit and function.
'RC': Customized repair, after repair the same item is sent back.
'-' : No repair, discard item,
see [A8.2 Decommissioning policy](#)
- Replacement instruction For this spare part a replacement instruction is available
- Remarks Provide extra information.

A8.4 Spares, overview

A8.4.1 Controllers, spares A.150

A8.4.2 Control supply, spares. A.152

A8.4.3 Mains supply. A.154

A8.4.4 Base, spares A.158

A8.4.5 Air supply unit, spares A.160

A8.4.6 Trolley lift, spares A.162

A8.4.7 Board transport, spares. A.164

A8.4.8 Placement head HA, spares A.168

A8.4.9 Toolbits and gripper for placement head HA. A.170

A8.4.10 Placement head DV, spares A.174

A8.4.11 Toolbits for placement head DV A.176

A8.4.12 XY robot, spares A.178

A8.4.13 Vision, spares A.180

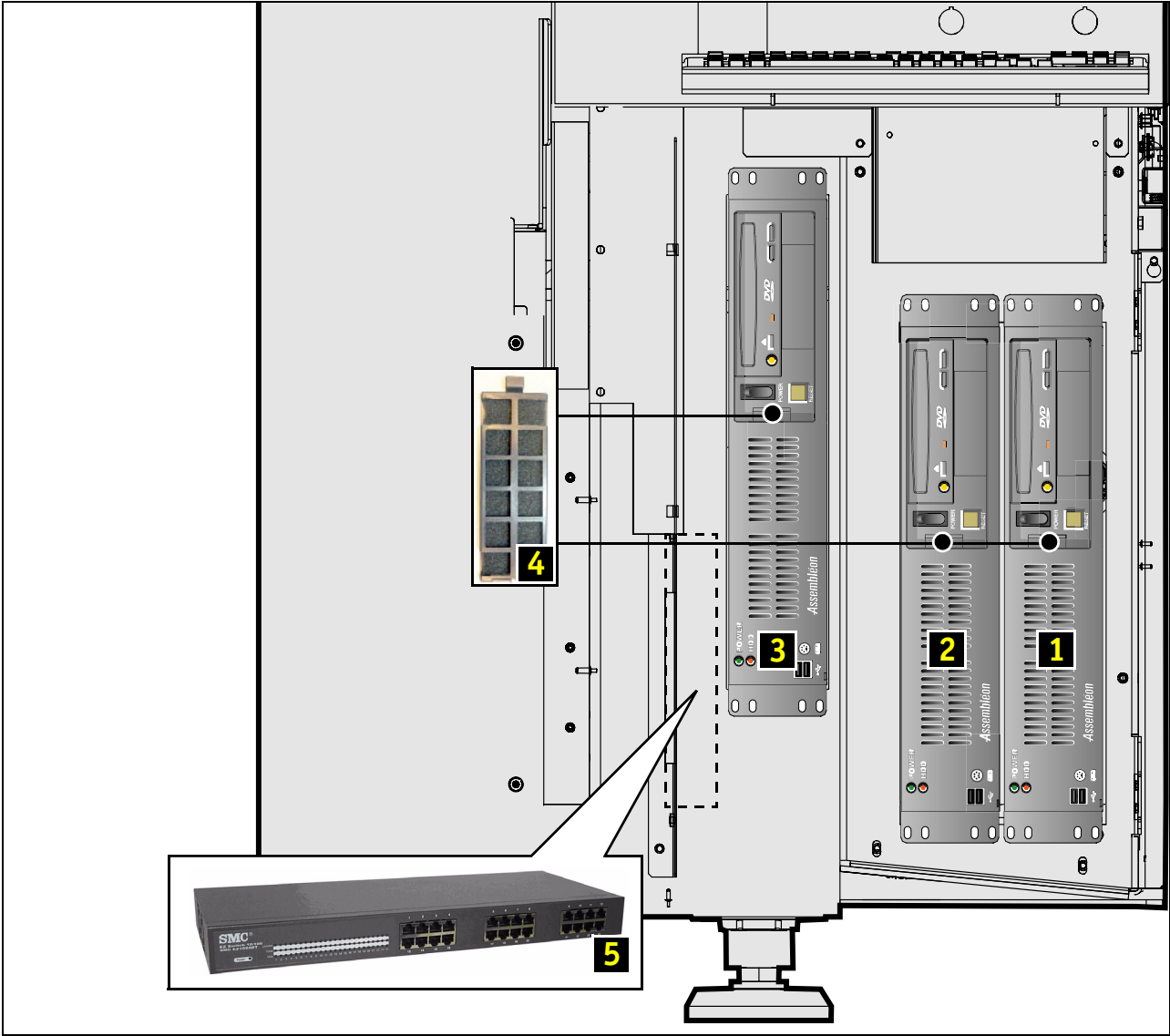
A8.4.14 Verification module, spares A.182

A8.4.15 Fluxer, spares A.183

A8.4.1 Controllers, spares

Current spare parts list, see www.assembleon.com							
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
1	-	9498-396-01603	System controller (ASC)	1	Y	-	-
2	-	9498-396-01604	Process controller (APC)	1	Y	-	-
3	-	9498-396-01605	SVS-Pro controller	1	Y	-	- (Optional)
4	-	9498-396-01724	Air filter insert	3	-	-	- Part of maintenance kit
5	-	9498-396-00079	Switch				PA 2410/01

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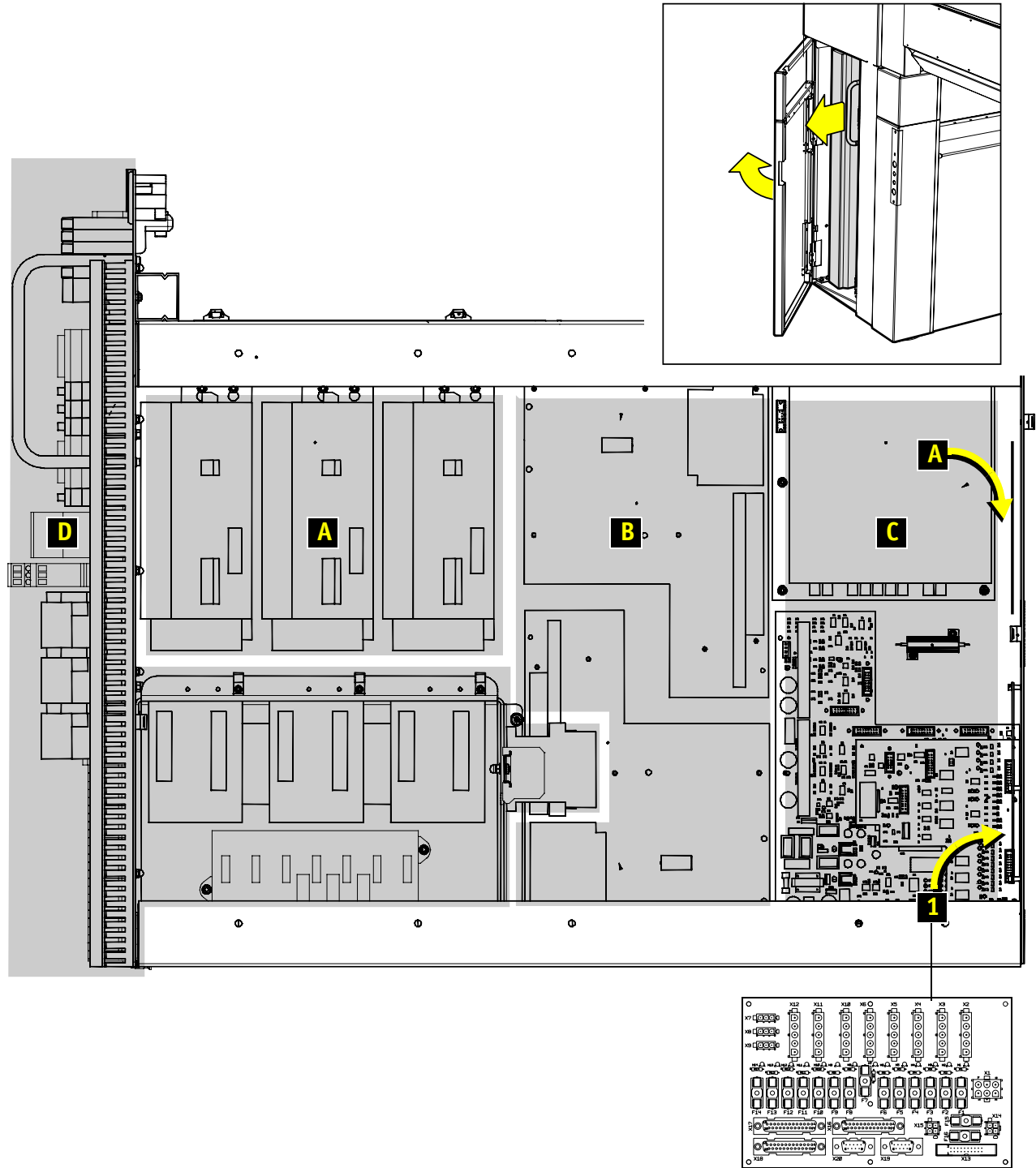


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A8.4.2 Control supply, spares

Current spare parts list, see www.assembleon.com								
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
1	-	9498-396-01647	Interconnection Board Elect	1	Y	-	-	
A	-	-	Parts of XY robot	A8.4.12 XY robot, spares				
B	-	-	Parts of pick and place	A8.4.8 Placement head HA, spares				
C	-	-	Parts of board transport	A8.4.7 Board transport, spares				
D	-	-	Mains supply	A8.4.3 Mains supply				

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A8.4.3 Mains supply

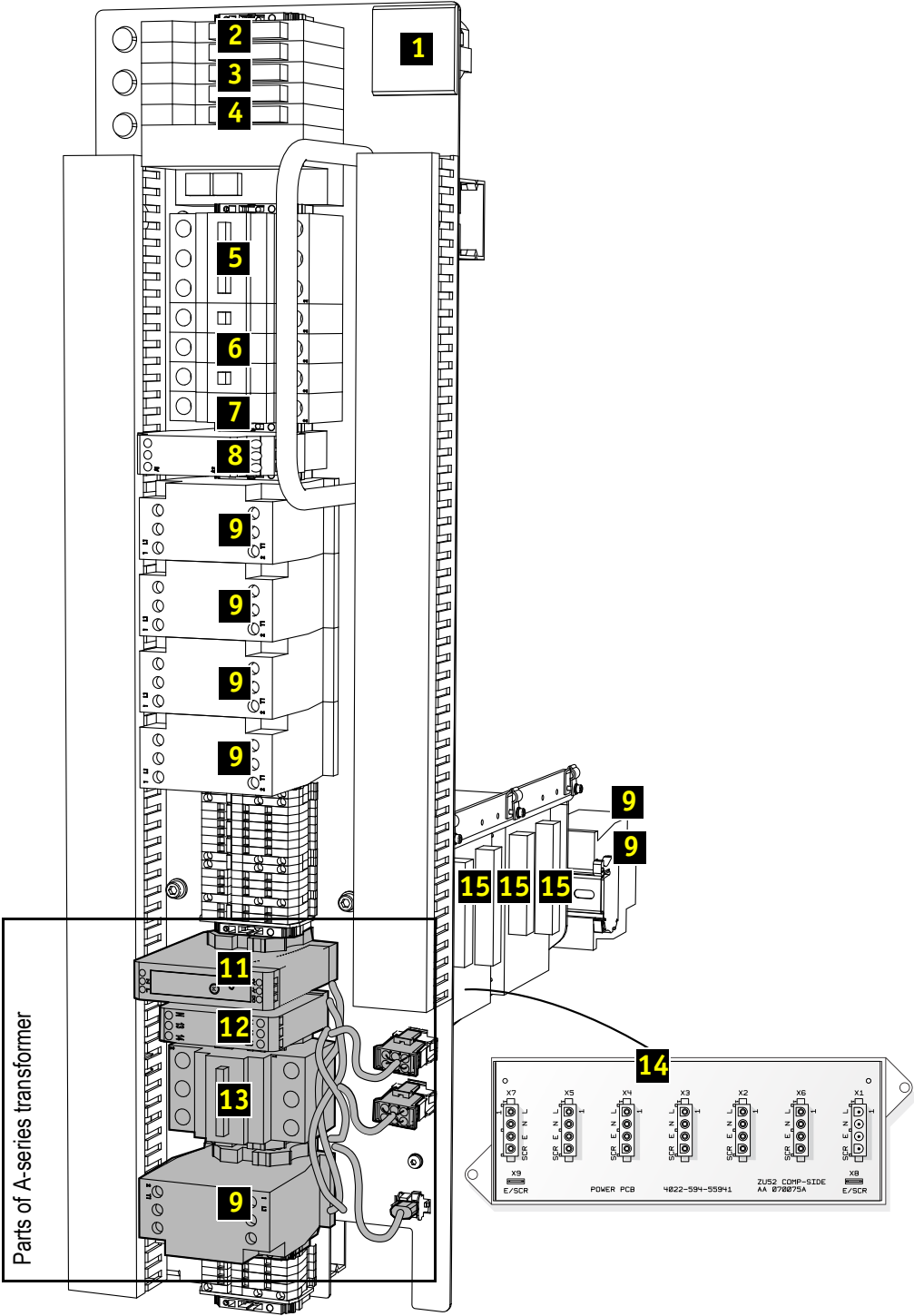
Mains supplies exist in different technical versions.

- [A8.4.3.1 Mains supply on PA2410/01, spares](#)
- [A8.4.3.2 Mains supply on PA2410/00, spares](#)

A8.4.3.1 Mains supply on PA2410/01, spares

Current spare parts list, see www.assembleon.com				Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description					
1	-	9498-396-01050	Hours counter	1	-	-	-	
2	-	9498-396-01623	Digital I/O, out	2	Y	-	-	
3	-	9498-396-01624	Digital I/O, in	3	Y	-	-	
4	-	9498-396-01622	Digital I/O, base	1	Y	-	-	
5	-	9498-396-02421	Circ. breaker 16A/3P	1	-	-	-	
6	-	9498-396-00023	Circ. breaker 8A/1P	3	-	-	-	
7	-	9498-396-00024	Circ. breaker 4A/1P	1	-	-	-	
8	-	9498-396-02423	Emergency Relay Pnoz X2P 24V	1	Y	-	-	ID no. 777303
9	-	9498-396-02410	Relay DILMC25-01 24V DC	6/7	-	-	-	
11	-	9498-396-02413	Supply 24V DC-1A	1	-	-	-	
12	-	9498-396-02412	3 Phase relay CM-PVE	1	-	-	-	
13	-	9498-396-00025	Circ. breaker 400V/4A 3P	1	-	-	-	
14	-	9498-396-02379	Power board	1	-	-	-	
15	-	9498-396-01621	Power supply 230V-24V DC/20A	3	-	-	-	

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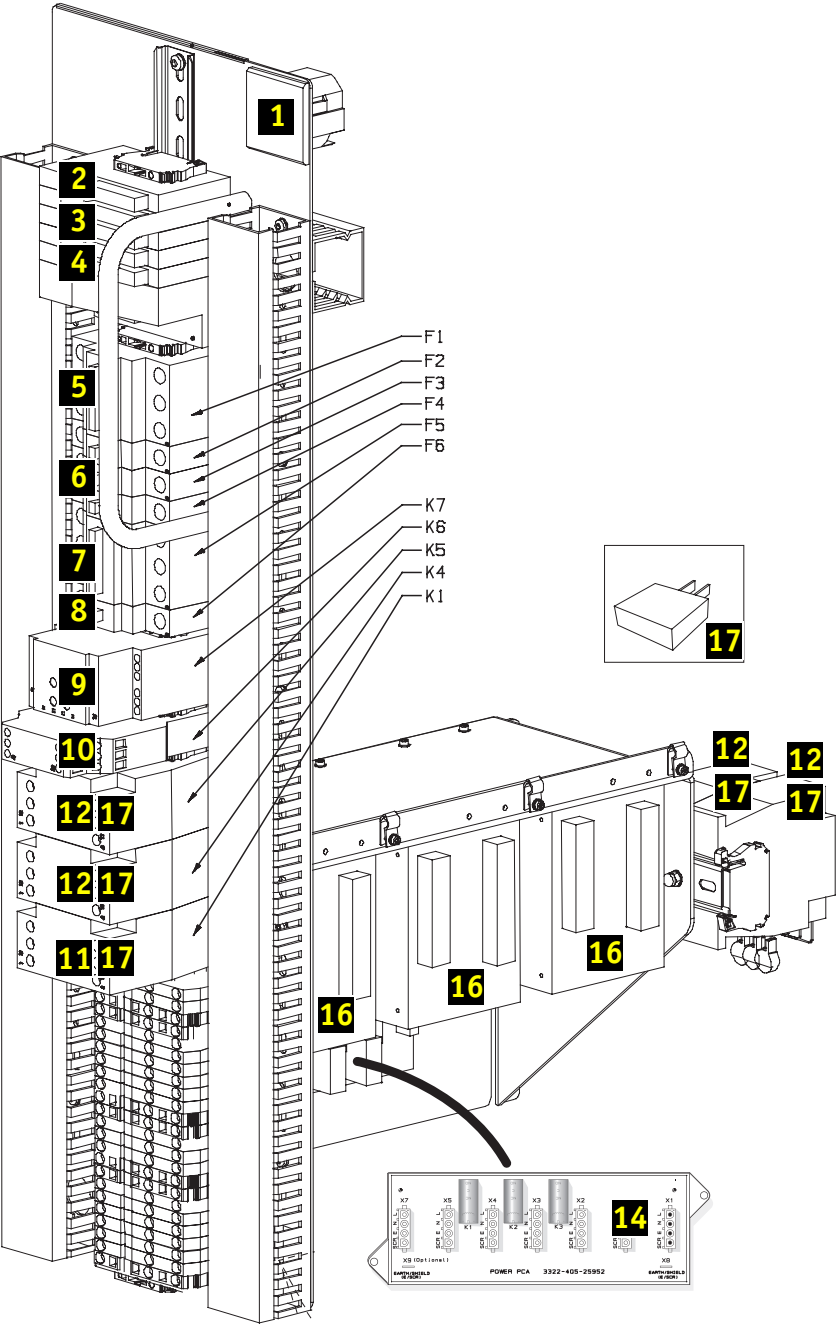


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A8.4.3.2 Mains supply on PA2410/00, spares

Current spare parts list, see www.assembleon.com					Qty/ Mod	Priority indicator	Repair options	Replacement instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description						
1	-	9498-396-01050	Hours counter		1	-	-	-	
2	-	9498-396-01623	Digital I/O, out		2	Y	-	-	
3	-	9498-396-01624	Digital I/O, in		3	Y	-	-	
4	-	9498-396-01622	Digital I/O, base		1	Y	-	-	
5	-	9498-396-01628	Circ. breaker 16A/3P		1	-	-	-	
6	-	9498-396-01627	Circ. breaker 8A/1P		3	-	-	-	
7	-	9498-396-01626	Circ. breaker 2A/3P		1	-	-	-	
8	-	9498-396-01625	Circ. breaker 2A/1P		1	-	-	-	
9	-	9498-396-01043	Phase guard relays		1	-	-	-	
10	-	9498-396-01629	Emergency Relays Pnozxi		1	Y	-	-	ID no. 777307
11	-	9498-396-01630	Relay MC25-10		1	-	-	-	
12	-	9498-396-01631	Relay MC25-01		4	-	-	-	
14	-	9498-396-00019	Power board		1	-	-	-	
16	-	9498-396-01621	Power supply 230V-24V DC/20A		3	-	-	-	
17	-	9498-396-01873	Suppressor		5	Y	-	-	

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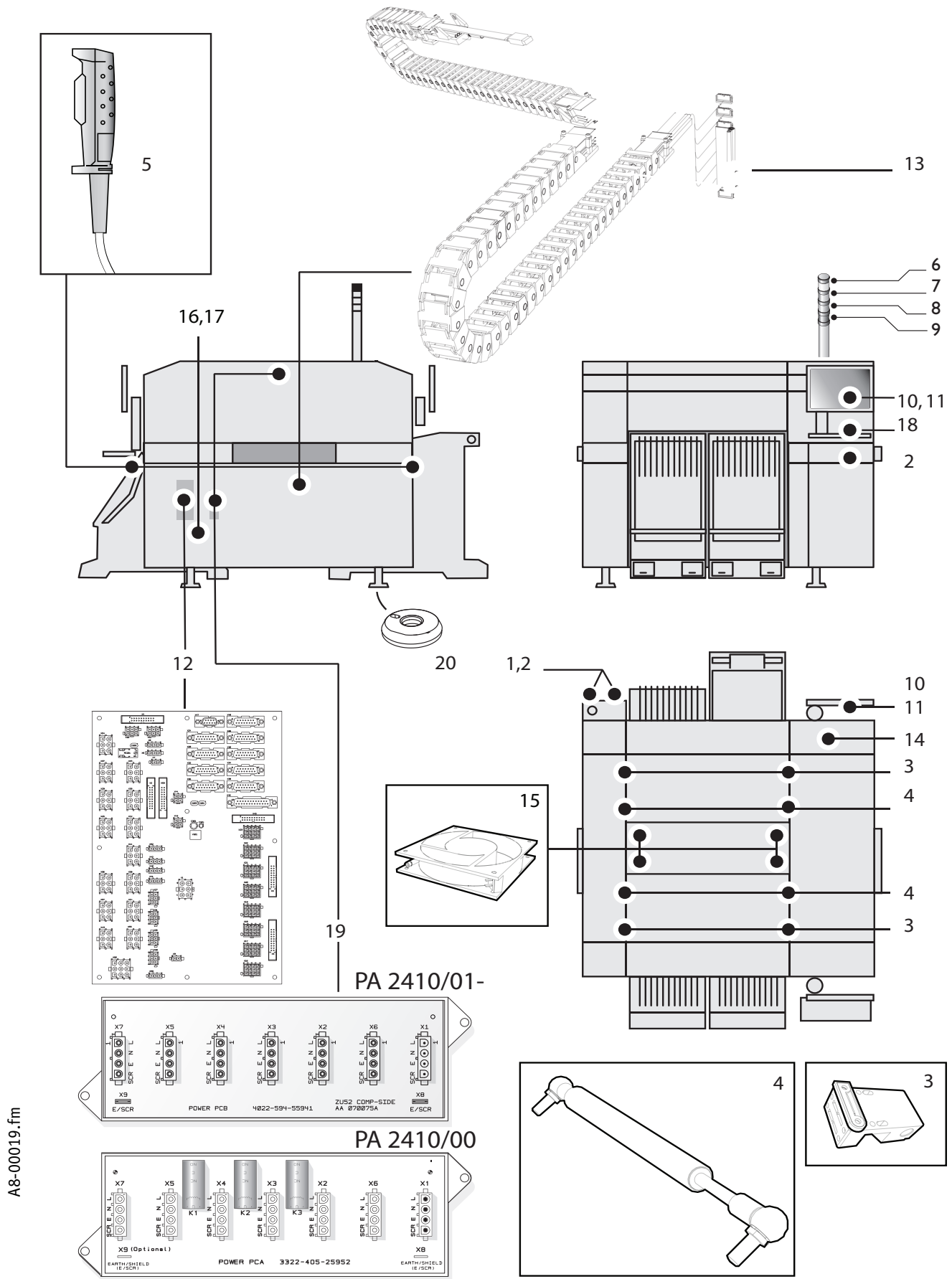


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A8.4.4 Base, spares

Current spare parts list, see www.assembleon.com							
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
1	-	9498-396-00026	Switch 16A	1	-	-	-
	-	9498-396-02415	Main switch 3-phase N	1	-	-	-
2	-	9498-396-00003	Emerg. stop actuator	2	-	-	-
3	-	9498-396-01649	Safety contact	4	Y	-	-
4	-	9498-396-01620	Gas spring	4	-	-	-
5	-	9498-396-01680	Enabling switch	2	-	-	-
6	-	9498-396-00005	Buzzer	1	-	-	-
7	-	9498-396-00007	Indicator white	1	-	-	-
8	-	9498-396-00008	Indicator blue	1	-	-	-
9	-	9498-396-00006	Indicator green	1	-	-	-
10	-	9498-396-00091	Touch screen	1	-	-	-
11	-	9498-396-00093	Power supply touch screen	1	-	-	-
12	-	9498-396-01099	Interconnection board base	1	Y	-	-
13	-	9498-396-01619	Cable interface pick and place	1	Y	-	-
14	-	-	Repeater				See A8.4.13 Vision, spares
15	-	9498-396-00109	Fan 230V 50/60Hz	1	-	-	-
16	-	9498-398-02123	Hardware key AX-201	1	-	RO	-
17	-	9498-396-02123	Temp. hardware key AX-201	1	Y	-	-
18	-	9498-396-00067	Keyboard	1	-	-	-
19	-	9498-396-02379	Power board	2	-	-	-
	-	9498-396-00019	Power board	2	-	-	-
20	-	9498-396-02418	Glued foot	1	-	-	-

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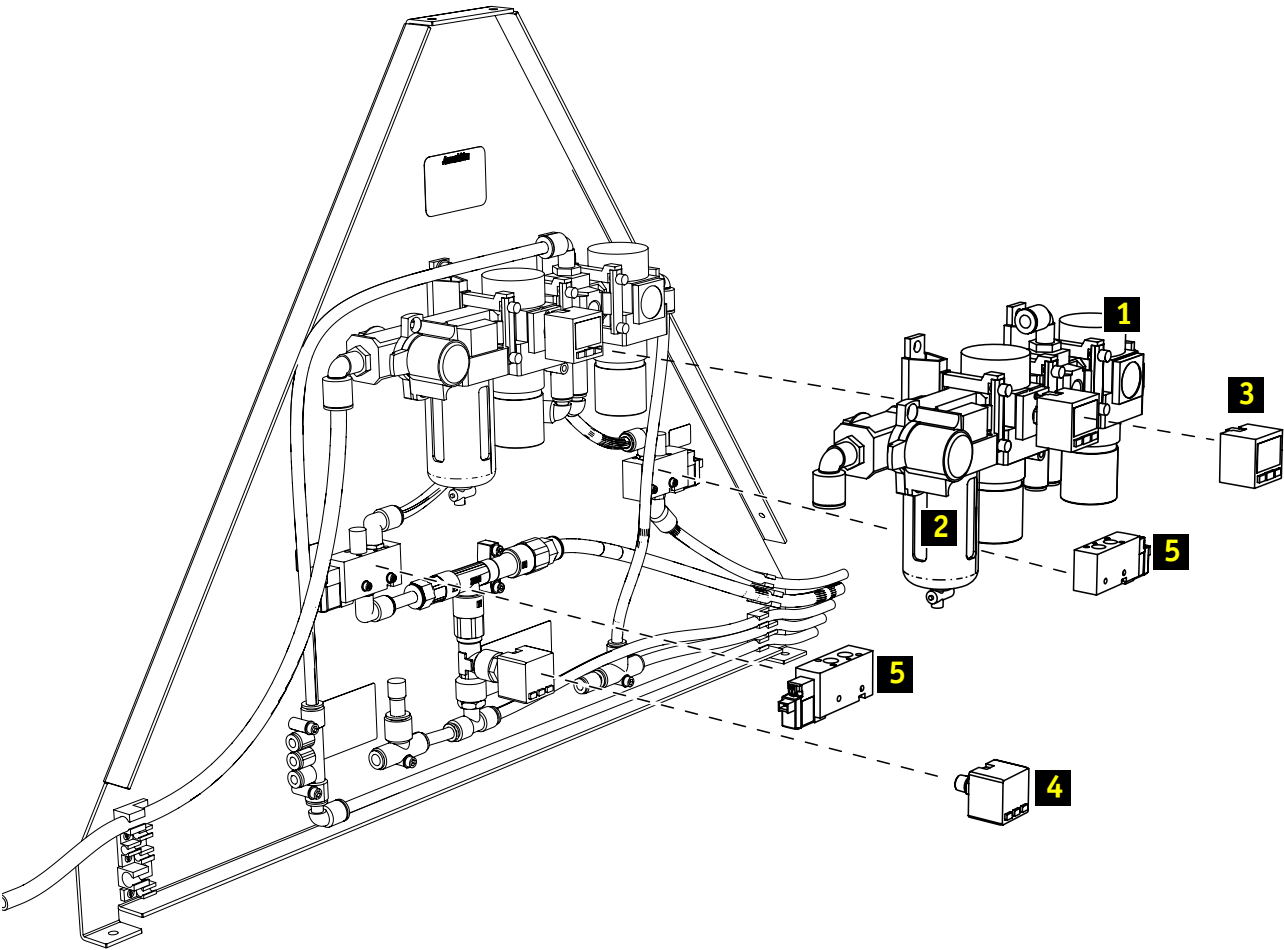


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A8.4.5 Air supply unit, spares

Current spare parts list, see www.assembleon.com							
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
1	-	9498-396-01644	Air supply unit	1	-	-	
2	1	9498-396-00062	Filter element 0.3	1	-	-	Part of maintenance kit
3	1	9498-396-02183	Pressure gauge	1	-	-	
4	-	9498-396-01646	Vacuum gauge	1	-	-	
5	-	9498-396-01645	Valve	2	-	-	

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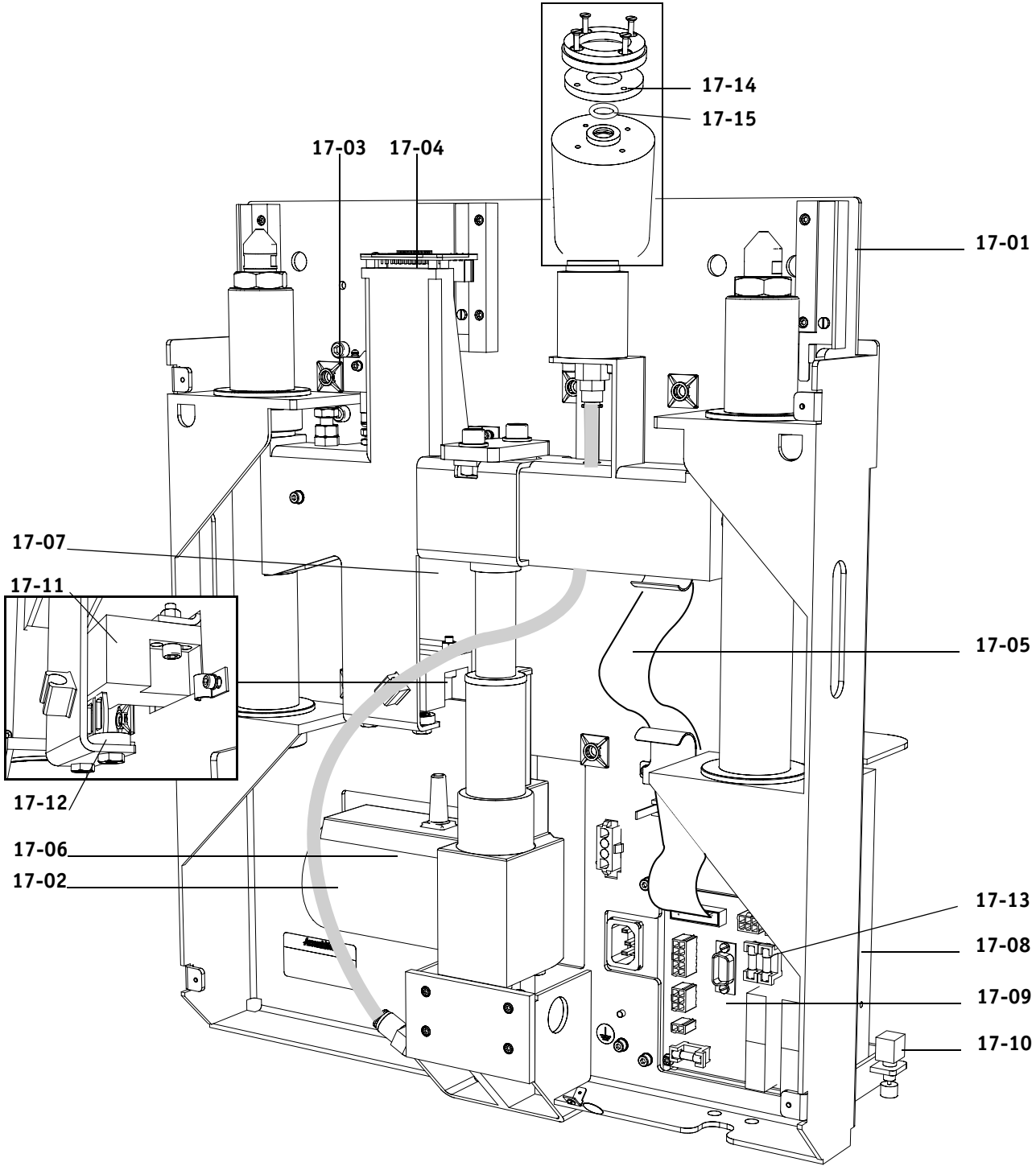


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A8.4.6 Trolley lift, spares

Current spare parts list, see http://espare.assembleon.com							
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
17-1	-	9498-396-00251	Trolley lift	1	-	-	• Complete trolley lift
17-2	17-1	9498-396-00252	Hose	1	Y	-	•
17-3	17-1	9498-396-00253	Micro switch	1	Y	-	•
17-4	17-1	9498-396-00254	Base interface board	1	Y	-	•
17-5	17-1	9498-396-00255	Flat cable	1	Y	-	•
17-6	17-1	9498-396-00256	Actuator	1	Y	-	•
17-7	17-1	9498-396-00257	Power cable	1	Y	-	•
17-8	17-1	9498-396-00258	Power supply 24 V	1	Y	-	•
17-9	17-1	9498-396-00259	Trolley lift controller	1	Y	-	•
17-10	17-1	9498-396-00260	Switch	1	Y	-	• Cable included
17-11	17-1	9498-396-00261	Safety interlock	1	Y	-	• Cable included
17-12	17-1	9498-396-00262	Safety interlock actuator	1	Y	-	•
17-13	17-1, 17-9	9498-396-00263	Fuse slow 4AT UL	2	Y	-	• One spare fuse is already present on the trolley lift controller.
17-14	17-1	9498-396-00123	Rubber ring	1	Y	-	• Also in trolley lift 4022-510-7995x
17-15	17-1	9498-396-00122	O-ring 7.65x1.78	1	Y	-	• Also in trolley lift 4022-510-7995x

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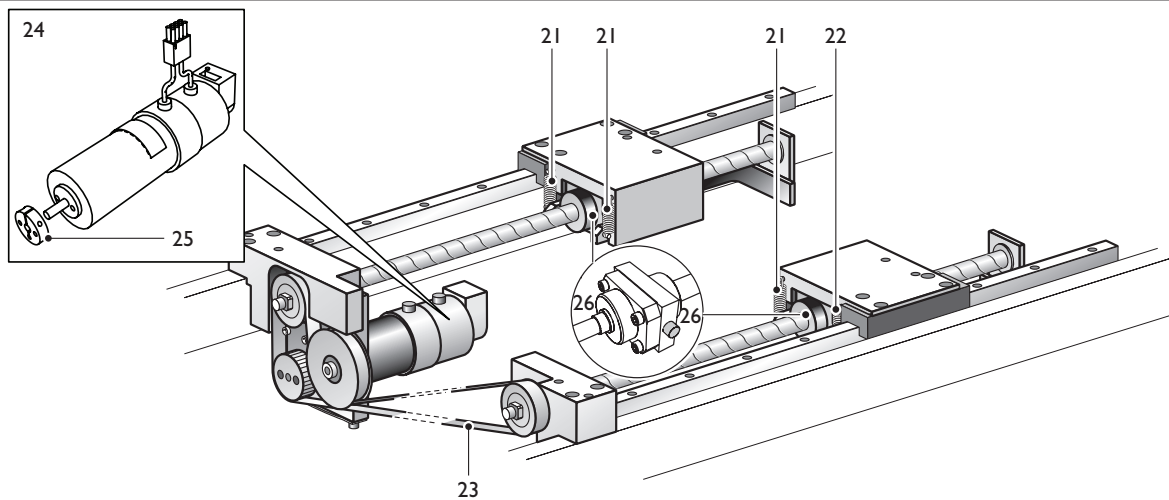
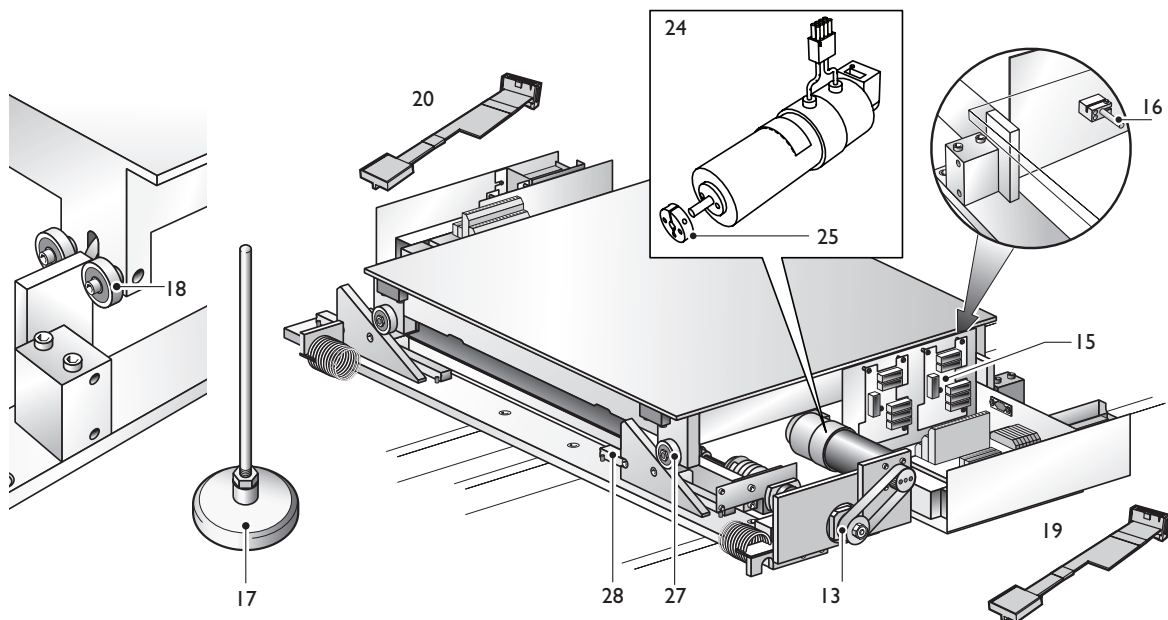
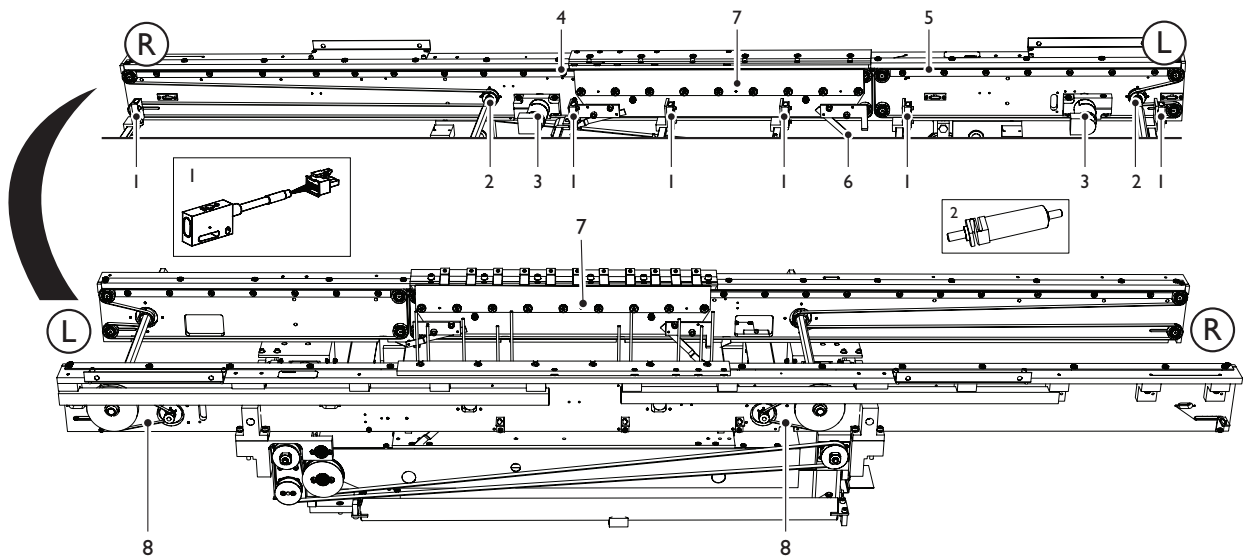


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A8.4.7 Board transport, spares

Current spare parts list, see www.assembleon.com					Qty/ Mod	Priority indicator	Repair options	Replacement instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description						
1	-	9498-396-02400	Board sensor	6	Y	-	-		
2	-	5322-528-11036	Coupling conveyor	2	-	-	-		
3	-	5322-361-10881	Conveyor motor	2	Y	-	-		
4	-	9498-396-01618	Conveyor belt WA	2	Y	-	-	l=4090	
5	-	5322-358-10178	Conveyor belt RI	2	Y	-	-	l=1314	
6	-	5322-466-11138	Wiper tip	4	-	-	-		
7	-	5322-466-11137	Clamping blade support	2	-	-	-		
8	-	5322-358-10176	Timing belt conveyor	3	Y	-	-	6 T2.5/330	
9	-	5322-693-22781	SMEMA board	2	-	-	-	Not shown	
10	-	5322-320-11462	SMEMA cable	2	-	-	-	Not shown	
13	-	5322-358-10175	Timing belt lift	1	Y	-	-	10 T5/260	
15	-	5322-214-91176	Driver board	3	Y	-	-		
16	-	5322-210-20334	EPD lift	1	Y	-	-	PNP 6.5	
17	-	5322-535-10314	Magnetic support pin	6	-	-	-		
18	-	5322-520-10808	Roller bearing	6	-	-	-	8 x 24	
19	-	9498-396-01291	Cable LIFT EMC.X1	1	-	-	-		
20	-	9498-396-01292	Cable WIDTH EMC.X1	1	-	-	-		
21	-	5322-492-11179	Tension spring	3	-	-	-		
22	-	5322-492-11183	Tension spring	1	-	-	-		
23	-	5322-358-10179	Timing belt	1	Y	-	-	10 AT 5/2000	
24	-	5322-361-10879	Motor	2	Y	-	-		
25	24	9498-396-02368	Shaft clamp	2	-	-	-		
26	-	9498-396-01293	Dowel	4	-	-	-		
27	-	5322-520-10807	Roller bearing	3	-	-	-		
28	-	5322-463-11062	Linear guide lift	3	-	-	-		

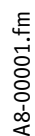
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Current spare parts list, see www.assembleon.com								
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
1	-	5322-216-04093	DCPA 60/8D	1	Y	-		
2	-	5322-216-04091	Transport controller	1	Y	-		
	-	9965-000-15024	Transport controller rep	1	Y	RO		
3	1/2	9498-396-00492	Fuse slow 2AT UL	2	-	-		
4	2	9498-396-00263	Fuse slow 4AT UL	1	-	-		
5	-	5322-115-60151	Resistor 10 Ohm - 50W	1	-	-		

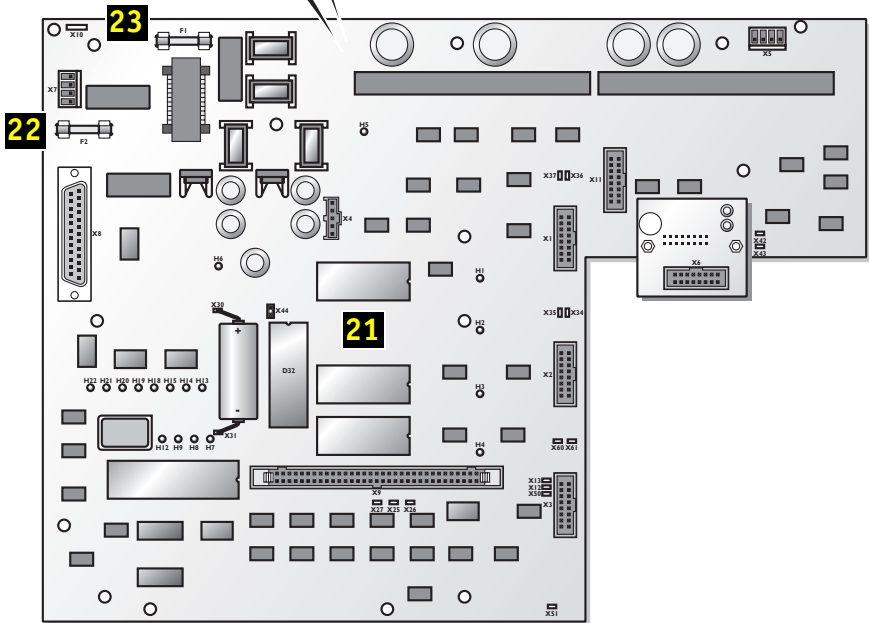
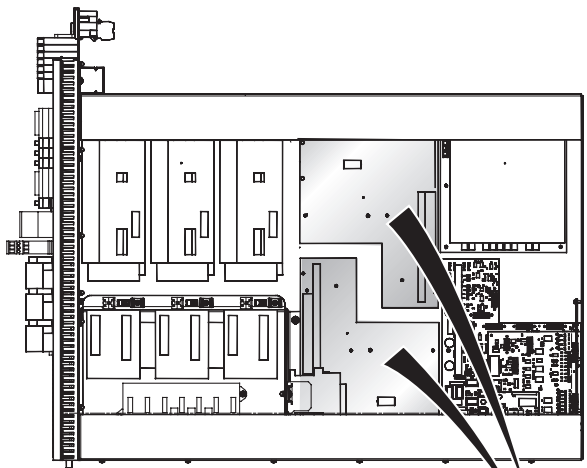
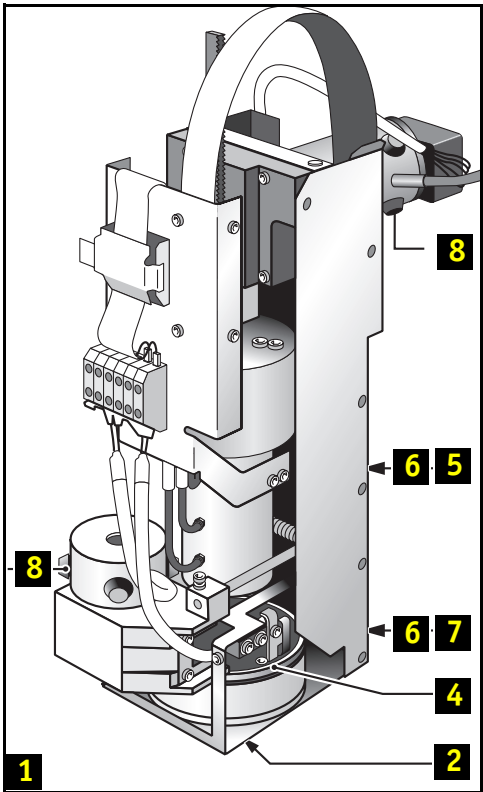
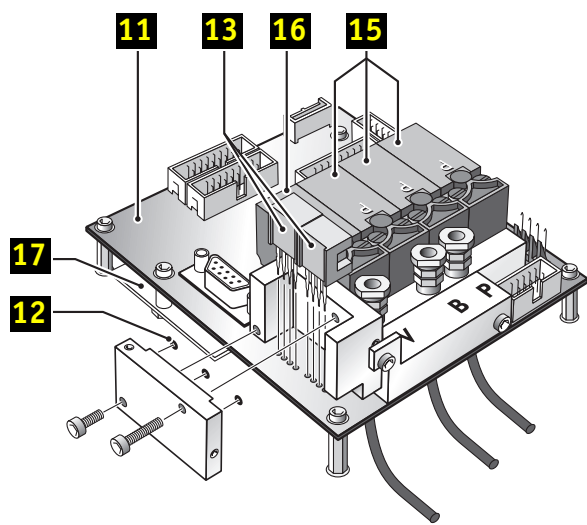
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A8.4.8 Placement head HA, spares

Current spare parts list, see www.assembleon.com							
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
1	-	9498-396-01919	Placement head (new)	1	Y	-	
	-	9498-397-01919	Placement head (refurb.)	1	-	RO	
2	1	5322-530-10386	O-ring	2	-	-	
4	1	5322-358-10181	Belt	1	-	-	
5	1	9498-396-00584	Screw M4x20	2	-	-	
6	1	4822-530-80163	Curved washer M4	4	-	-	
7	1	5322-502-14434	Screw M4x12	2	-	-	
8	1	9498-396-01388	Carbon brush	8	-	-	Set of 4 brushes
11	-	9498-396-00972	Manifold	1	Y	-	
12	11	5322-530-51243	O-ring	3	Y	-	
13	11	5322-209-32572	Pressure sensor 26PC	1	Y	-	
15	11	5322-281-20176	Pressure valve	3	Y	-	
16	11	5322-281-20173	Vacuum valve	1	Y	-	
17	-	9498-396-00973	Resolution extender	1	Y	-	See SI-AQ/D9-039
21	-	9498-396-00556	Placement head contr.	1	Y	-	
	-	9498-397-00556	Placement head contr. rep	1	-	RO	
22	21	9498-396-00492	Fuse slow 2AT UL	1	Y	-	
23	21	9498-396-00263	Fuse slow 4AT UL	1	Y	-	

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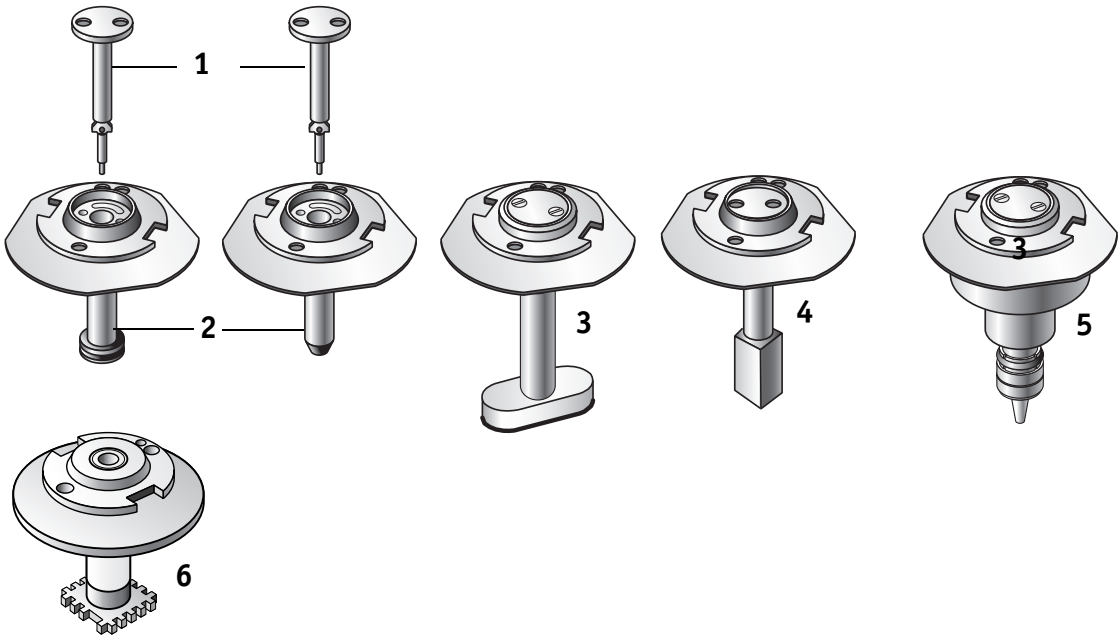


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A8.4.9 Toolbits and gripper for placement head HA

Current spare parts list, see www.assembleon.com							
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
1		5322-360-10446	Nozzle I1	1	Y	-	PA 2744/50
		5322-360-10447	Nozzle I2	1	Y	-	PA 2744/60
		5322-360-10448	Nozzle I3	1	Y	-	PA 2744/70
		9498-396-00326	Nozzle I4	1	Y	-	PA 2744/80
		5322-360-10449	Nozzle I5	1	Y	-	PA 2749/00
		5322-360-10451	Nozzle I6	1	Y	-	PA 2749/10
		9498-396-00327	Nozzle I10	1	Y	-	PA 2749/50
2		9498-396-01822	Nozzle O1 PH HA	1	Y	-	PA 2744/11
		9498-396-01823	Nozzle O2 PH HA	1	Y	-	PA 2744/21
		5322-360-10444	Nozzle O3	1	Y	-	PA 2744/30
		5322-360-10445	Nozzle O4	1	Y	-	PA 2744/40
3		9498-396-00329	Nozzle O5	1	Y	-	PA 2749/61
4		9498-396-00328	Nozzle S1	1	Y	-	PA 2749/60
		9498-396-00330	Nozzle S2	1	Y	-	PA 2749/62
		9498-396-00331	Nozzle S3	1	Y	-	PA 2749/63
5		9498-396-00332	Nozzle FC 1	1	Y	-	PA 2752/00
		9498-396-00333	Nozzle FC 2	1	Y	-	PA 2752/10
		9498-396-00334	Nozzle FC 3	1	Y	-	PA 2752/20
		9498-396-00335	Nozzle FC 4	1	Y	-	PA 2752/30
6		5322-360-10311	Calibration nozzle	1	Y	-	

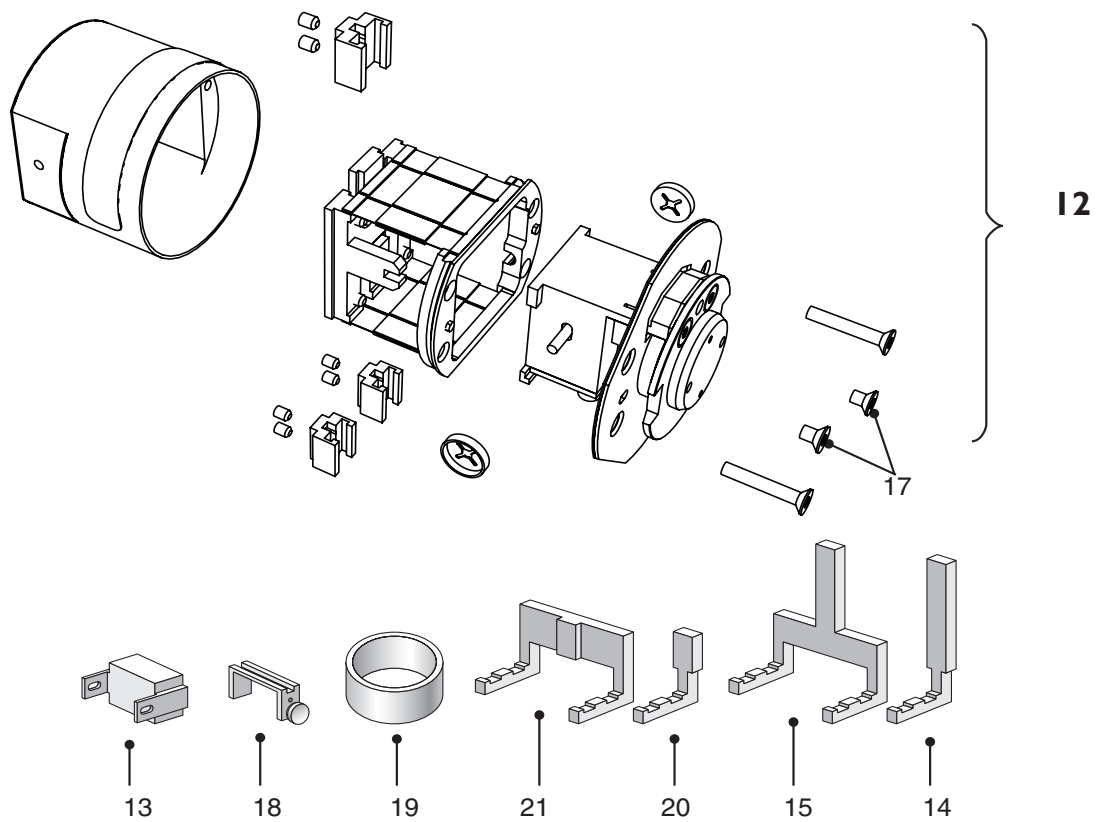
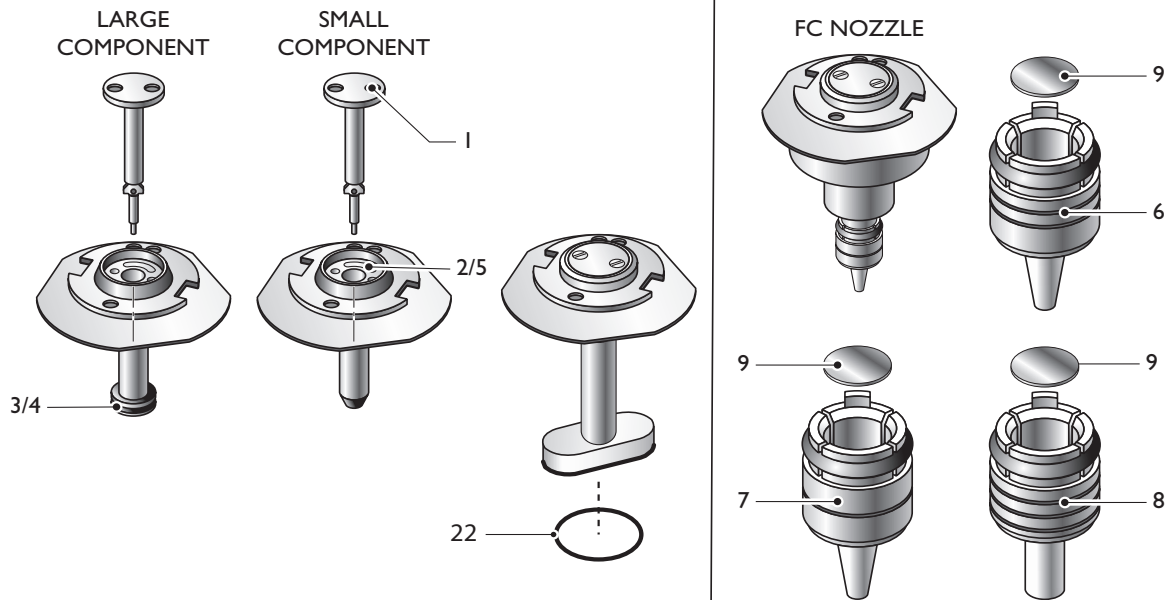
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Current spare parts list, see www.assembleon.com				Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description					
1	-	5322-502-14433	Screw M1.8x4	2	-	-		Screws for O-nozzles
2	-	5322-480-10169	Dust catch	1	-	-		for O-nozzles
3	-	5322-532-12952	V seal O9	1	-	-		for nozzles O3
4	-	5322-532-12953	V seal O4	1	-	-		for nozzles O4
5	-	5322-466-12073	Sealing plate	1	-	-		For O-nozzles
6	-	4022-526-69470	Nozzle tip FC2	1	-	-		PA 2752/10
7	-	4022-526-69480	Nozzle tip FC3	1	-	-		PA 2752/20
8	-	4022-526-69490	Nozzle tip FC4	1	-	-		PA 2752/30
9	-	4022-526-69730	Dust catch filter FC nozzle	1	-	-		Package of 10 pieces
11	-	9498-396-01870	Gripper	1	-	-		PA 2751/30
12	11	4022-526-53510	Assy Gripper	1	-	-		
13	-	5322-404-10993	Gripp. Z-supp consumable	1	-	-		
14	11	4022-526-69540	Single high jaw	1	-	-		
15	11	4022-526-69590	Double high jaw	1	-	-		
16	-	2622-150-09127	Square hex. screwdr. 0.9mm	1	-	-		Not shown
17	11	4022-526-53020	Screw A4 M2x3	1	-	-		Set of 10
18	-	5322-395-10863	Configuration plate	1	-	-		
19	11	5322-532-13143	Distance ring	1	-	-		
20	11	4022-526-69550	Single low jaw	1	-	-		
21	11	4022-526-69580	Double low jaw	1	-	-		
22	-	9498-396-02296	O-ring	1	-	-		for nozzles O5

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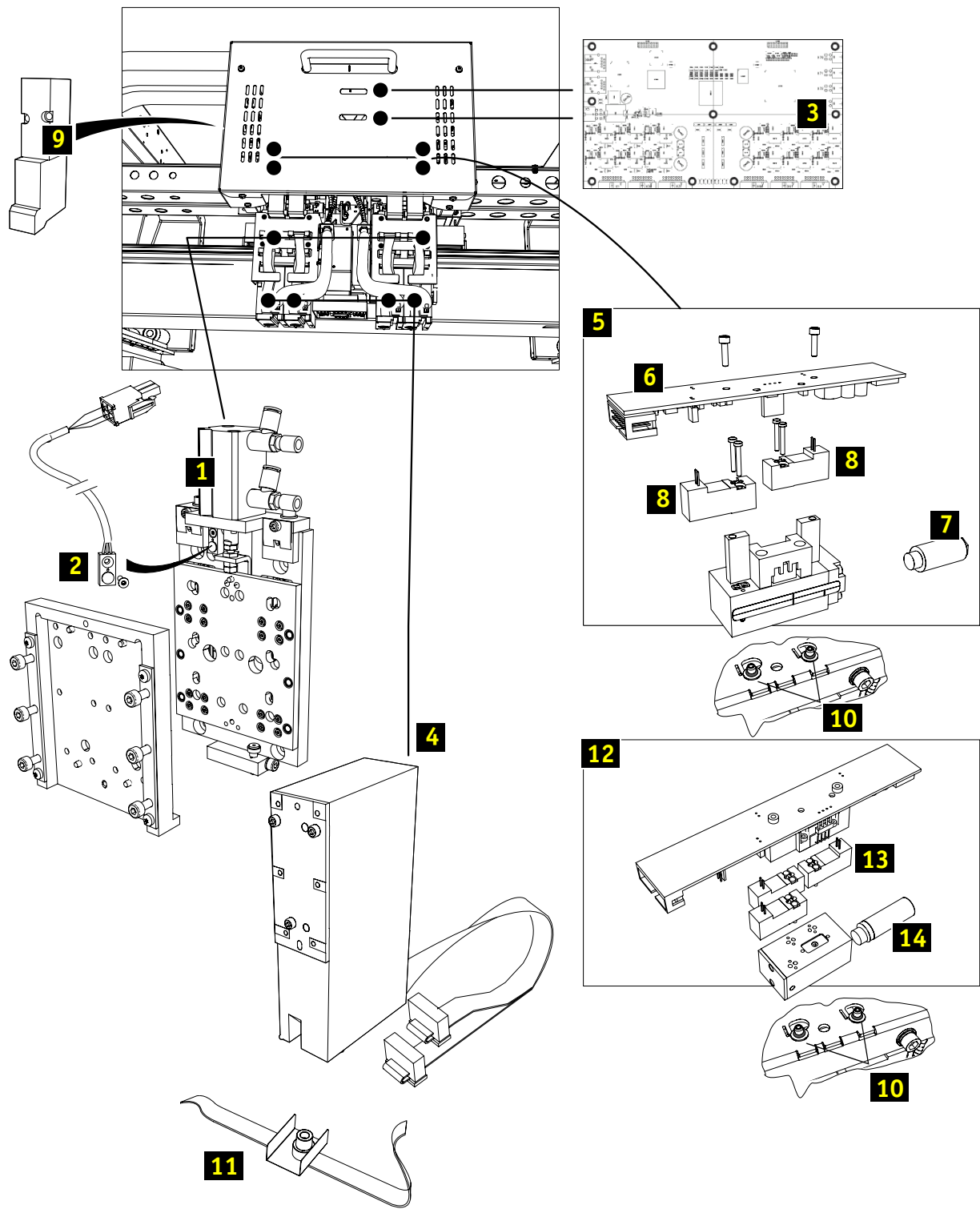


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A8.4.10 Placement head DV, spares

Current spare parts list, see www.assembleon.com								
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
1	-	9498-396-02502	Z-lift	2	-	-	•	
2	1	9498-396-02003	Sensor	2	-	-	•	
	1		Screw	2	-	-	•	Part of Maintenance kit
3	-	9498-396-01611	Placement head DV controller	2	Y	-	•	
4	-	9498-396-01610	Placement head	4	Y	-	•	
	-	9498-397-01610	Placement head rep	4	-	RO	•	
5	-	9498-396-00047	Pneumatic controller	4	Y	-	•	2 valve system
6	5	9498-396-00046	Pneum. Controller board	4	-	-	•	
7	5	9498-396-00065	Silencer	4	-	-	•	
8	5	9498-396-00066	Valve	8	-	-	•	
9	-	9498-396-01650	Valve z-lift	2	-	-	-	
10	-	-	O-ring	8	-	-	-	Part of Maintenance kit
11	4	9498-396-00851	Transport strap	-	-	-	-	
12	-	9498-396-02118	Pneumatic controller	4	-	-	•	3 valve system
13	12	9498-396-02297	Valve	1	-	-	•	
14	12	9498-396-02164	Silencer	3	-	-	•	

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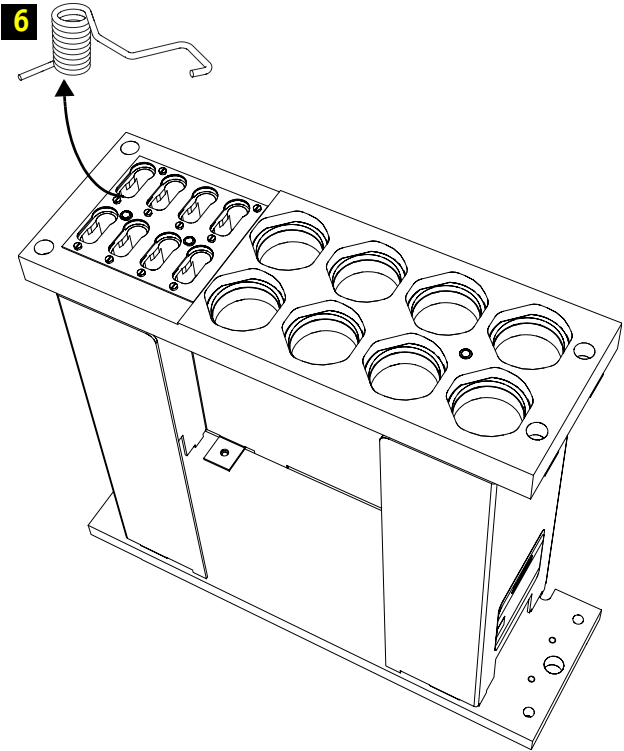
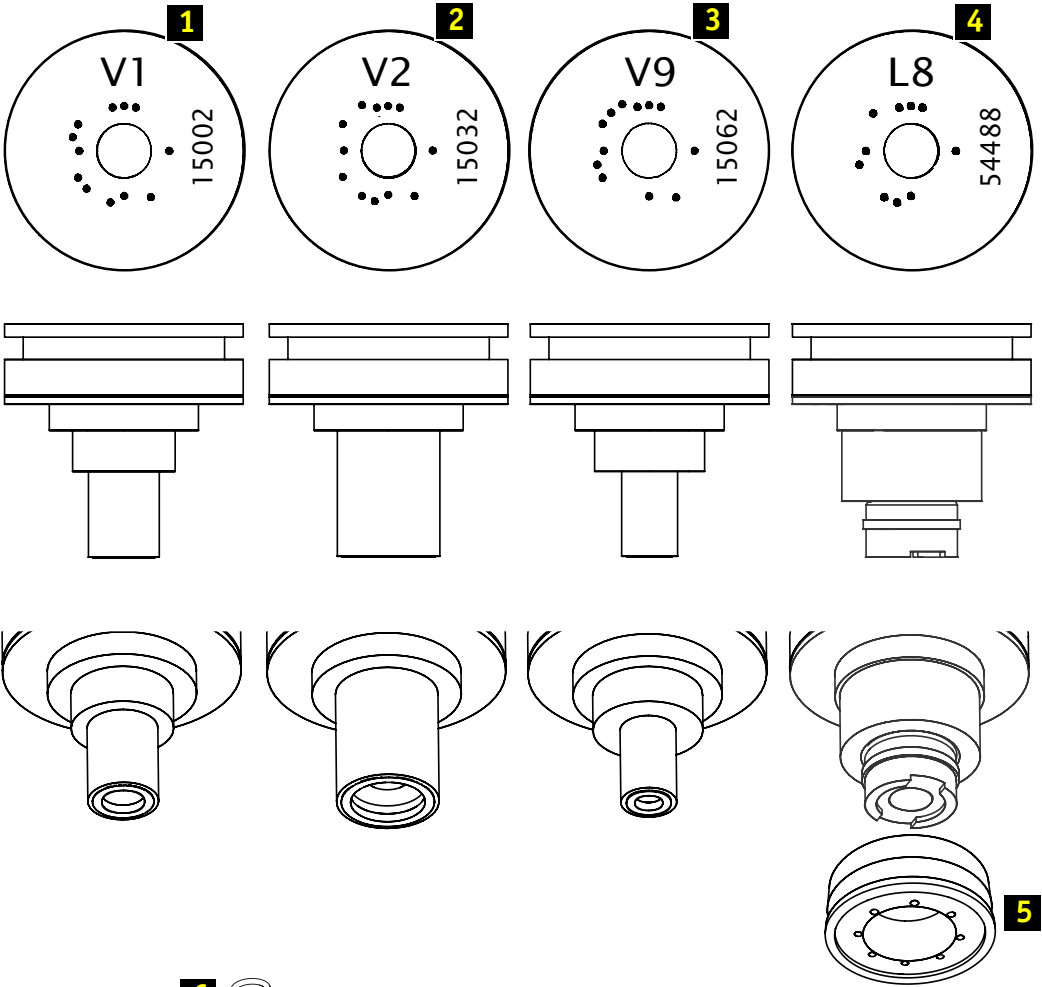


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A8.4.11 Toolbits for placement head DV

Current spare parts list, see www.assembleon.com					Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description						
1	-	9498-396-01819	Nozzle set V1	-				Contains 4 toolbits	
2	-	9498-396-01820	Nozzle set V2	-				Contains 4 toolbits	
3	-	9498-396-01821	Nozzle set V9	-	-	-	-	Contains 4 toolbits	
4	-	9498-396-01874	Nozzle set L8	-				Contains 5 toolbits	
5	-	9498-396-01202	V seal round 9 set	-				Contains 5 seals, applicable for L8, V5, V6	
6	-	9498-396-00168	Torsion spring	8					

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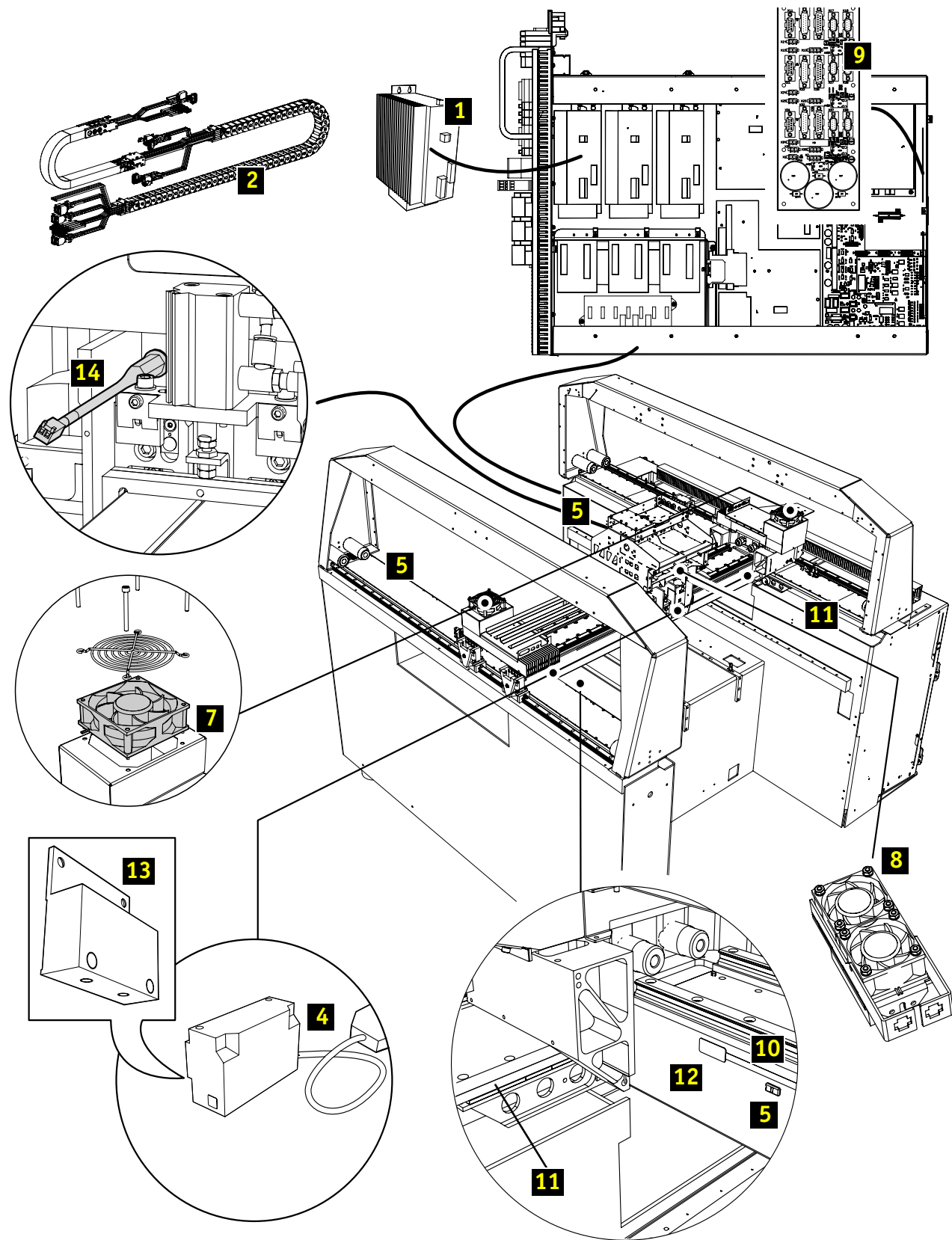


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A8.4.12 XY robot, spares

Current spare parts list, see www.assembleon.com				Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description					
1		9498-396-01606	Motion amplifier	3	-			
2		9498-396-02004	Cable interface XY robot	1	-			
4		9498-396-01607	X/Y-axis encoder RGH41	3	-			
5		9498-396-01608	Reference marker	3	-			
7		9498-396-01642	Fan Y motor	2	-			
8		9498-396-01643	Fan X motor	1	-			
9		9498-396-01648	Interface board drives (IBD)	1	-			
10		9498-396-02030	Linear scale, X-axis	1	-			840 mm
11		9498-396-02031	Linear scale, Y-axes	2	-			1440 mm
12		9498-396-02027	End clamp kit	2	-			For linear scale X-axis
13		9498-396-02058	Y encoder block	2	-			
14		9498-396-02424	Temp. sensor X axis	1	-			

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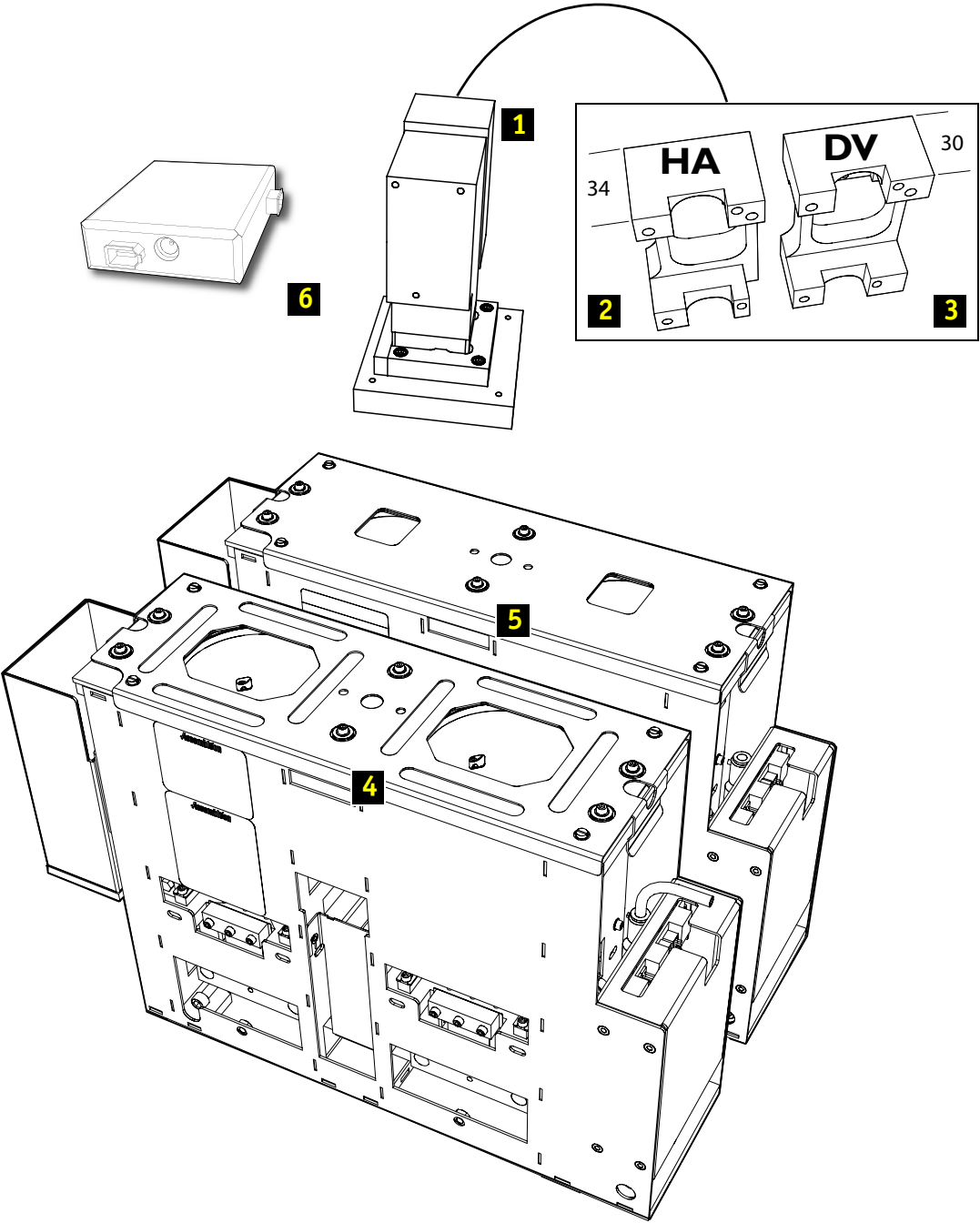


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A8.4.13 Vision, spares

Current spare parts list, see www.assembleon.com				Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description					
1	-	9498-396-01894	BA camera	2	Y	-		
2	-	9498-396-02275	BA camera interface	1	-	-		Between HA heads
3	-	9498-396-02276	BA camera interface	1	-	-		Between DV heads
4	-	9498-396-01100	CA camera, LFOV	1	-	-		
	-	9498-397-01100	CA camera, LFOV, rep	1	-	RO		
5	-	9498-396-01692	CA camera, SFOV	1	-	-		
	-	9498-398-01692	CA camera, SFOV, rep	1	-	RC		
6	-	9498-396-00495	Repeater	1	-	-		

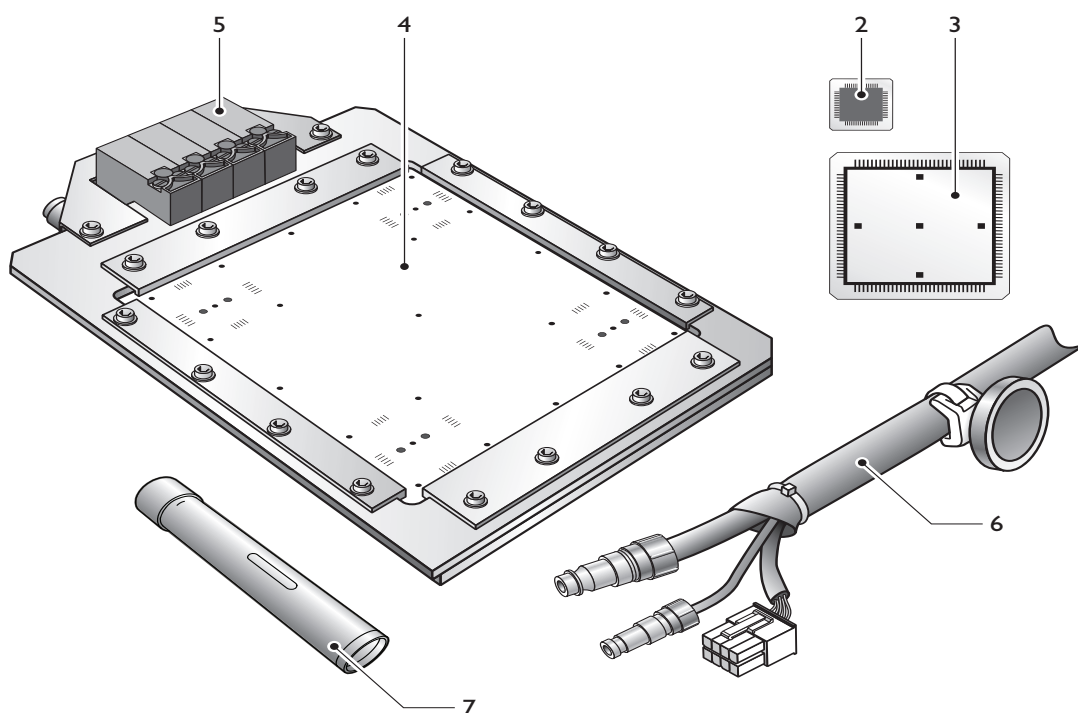
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A8.4.14 Verification module, spares

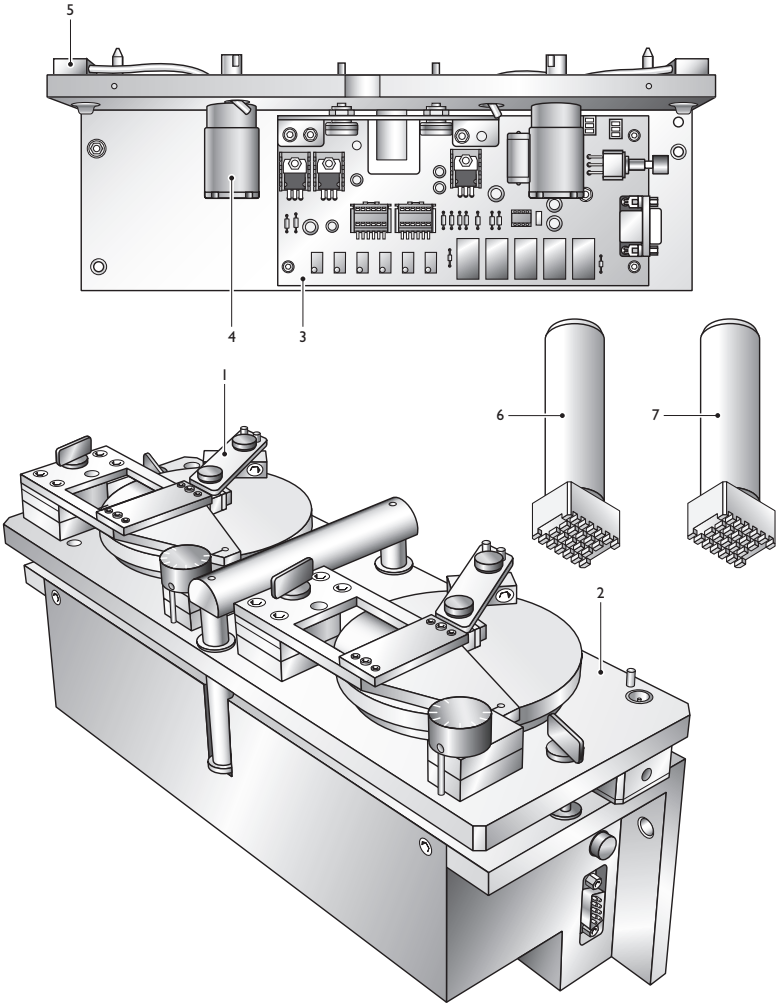
Current spare parts list, see www.assembleon.com								Remarks
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	
1	-	5322-395-10689	Verification tool	1	-	-		PA 2832/00
2	1	5322-395-10883	Glass QFP64	1	-	-		
3	1	5322-395-10884	Glass QFP160	1	-	-		
4	1	5322-395-10885	Glass circuit board	1	-	-		
5	1	5322-281-20173	Vacuum valve	4	-	-		
6	1	5322-320-12773	Connecting hose	1	-	-		
7	1	5322-395-10882	Pen - vacuum 4 1/4"	1	-	-		



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A8.4.15 Fluxer, spares

Current spare parts list, see www.assembleon.com				Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description					
20-01	20-02	5322 693 11597	Assy wiper fluxer	2	-	-		
20-02	-	5322 693 11598	Top module fluxer	1	-	-		
20-03	-	5322 216 04668	Board fluxer	1	-	-		
20-04	-	5322 361 11176	Motor fluxer	2	-	-		
20-05	-	5322 218 12053	EPD fluxer	2	-	-		
20-06	-	5322 395 10871	Calibration tool fluxer	1	-	-		20 - 60 µm
20-07	-	4022 594 12820	Calibration tool	1	-	-		70 - 120 µm



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A8.5 Materials

A8.5.1 Materials, definitions

- Standard materials Tools and materials needed for preventive maintenance, local obtainable
- Maintenance kit A collection of spare parts and materials that enables the customer to perform preventive maintenance, based on a 2 year period and a maximum machine configuration, and also simple repairs that do not require specific knowledge or tools. This collection is available as a PA number via regular commercial channels.
- Second level spare parts A collection of spare parts that is recommended to be available on-site at the customer. The collection of parts is defined to minimize the machine downtime, taking into account the failure probability of parts and machine modularity. This collection is not available as a kit but can be ordered for each part separately.
- Description Name of the material.
- Ordering code The code number with which the material or material kit can be ordered at your regional service center.
- Application Indication of what purpose the material is used for. In case of a part, the assembly it belongs to is mentioned. In case of a material, the maintenance action it is used for is mentioned.
- Picture/spare part reference Information to identify the material when applicable. Either a picture or a reference to a drawing in the spare part section.

A8.5.2 Materials, overview

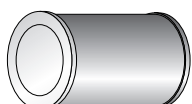

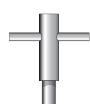


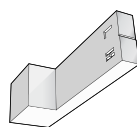





[A8.5.5 Standard materials](#)

[A8.5.3 Maintenance kit \(PA 2440/00\)](#)

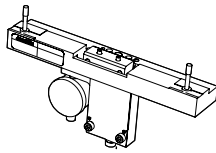

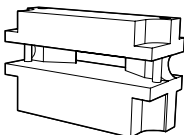


[A8.5.6 Second level spare parts](#)

[A8.5.7 Consumables](#)

A8.5.3 Maintenance kit (PA 2440/00)

Description	Ordering code	Amount	Used for		
Lubricating kit					
Grease gun	5322-395-10615	1	-		
Flexible hose	9498-396-02040	1	-		
Protection cap	-	1	-		
(Kluber) Isoflex Topas NCA52	5322-390-10151	1	Grease for XY robot bearings		
Lithium based grease NSK 1	5322-390-20159	1	Transport spindles, guides		
Anti score EP lube 3 grease	9498-396-00143	1	Placement head HA Z-motor, guide		
Optical kit					
Camel hair brush, optical tissues	9498-396-00043	1			
Miscellaneous					
Dust catch filter tool	5322-395-10774	1	Replacement tool for filters in placement head HA nozzles		
Board dismantling tool	5322-395-10282	1	Remove controller boards from control supply unit		
Filter element 0.3	9498-396-00062	2	Pneumatic air supply		
Filter (fan)	9498-396-01724	6	Air filter controllers		
Calibre Z-lift	9498-396-01905	1	Z-lift placement heads DV, adjustment		
Tie-wraps 15 cm	-	100	Fixation cables heads		
Tie-wraps 10 cm	-	100	Fixation cables heads		
Flatcable bracket (Large)	-	5	Placement head DV and Z-lift		
Loctite 243	-	1	All screws above Z=0 level unless otherwise defined		
Fuse puller	9498-396-02119	1	Pull fuses from boards		
PU HOSE 4	-	1 mtr	Manifold from AQ to AX-201		

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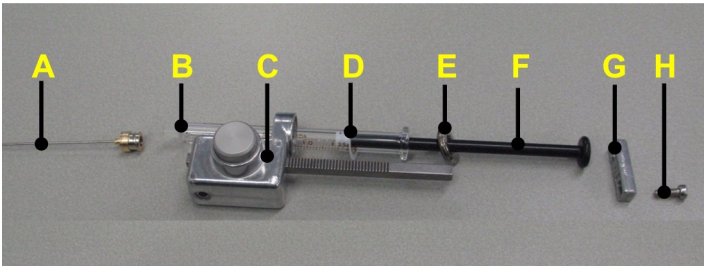

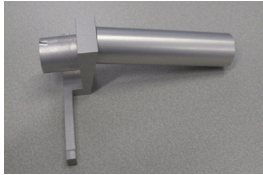
Description	Ordering code	Amount	Used for	
Encoder tool	9498-396-02059	1	Adjustment of encoders on Y-axes	
Plastic distance plate	9498-396-02075	1	X encoder adjustment	
Linear scale mounting tool on X-axis	9498-396-02024	1	-	
Linear scale mounting tool on Y-axes	9498-396-02026	1	-	
Assortment box				
Dust catch filter	5322-480-10169	1	Nozzle placement head HA	
Carbon brushes	9498-396-01388	16	Motors placement head HA	
Fuse slow F5x20 2 A	9498-396-00492	20	All boards	
Fuse slow F5x20 4 A	9498-396-00263	20	All boards	
Screw M1.8X4	5322-502-14433	20	Nozzle	
Screw M2.5X 8	9498-396-00250	10	Sensor Z-lift	
Screw M3X5	9498-396-00390	20	Placement head DV on interface bracket	
Screw M3X6	9498-396-00474	20	Encoder on X-axis	
Screw M3X8	9498-396-00475	20	Manifolds	
Screw M3X16	9498-396-00476	20	Encoder on Y-axes, power supply	
Screw M4X6	9498-396-01882	20	Controllers placement head DV Bracket pneumatic controller	
Screw M4X8	9498-396-01883	10	Clamps, pneumatic controller, fans Y-axis	
Screw M4X10	9498-396-01884	20	Bracket pneumatic controller Z-lift placement heads DV	
Screw M4X12	5322-502-14434	20	Interface placement head HA, bottom	
Screw M4X16	9498-396-01885	10	X-sensor	
Screw M4X20	9498-396-00584	20	Interface placement head HA, top	
Screw M4X25	9498-396-01886	10	BA camera	
Hex lock nut M4	9499-396-00665	10	Fans Y-axis	
Washer 3.2X7	9498-396-00699	20	All M3 screws placement head DV, manifold	
Curved spring washer M3	9498-396-00769	20	All M3 screws	
Curved spring washer M4	9498-396-00903	20	All M4 screws used in X-carriage	

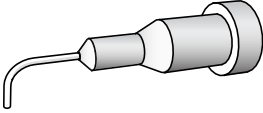
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Description	Ordering code	Amount	Used for	
Washer PF 3.2X7	9498-396-00951	20	Protection boards, manifold, DV controllers	
Washer 4.3X9	9498-396-00904	20	All M4 screws placement head DV on bracket	
Washer PF-CP M2,5	9498-396-01068	20	Manifold placement head HA	
Earth washer STL ST 4.3X8	9498-396-01069	10	Fans, brackets	
Earth washer STL ST 5.3X10	9498-396-01082	10	Hood, side plate	
Earth washer STL ST 6.4X14	9498-396-01188	10	Earth to covers	
O-ring placement head HA	5322-530-10386	10	Nozzle interface	
O-ring 2.3 x 0.9	5322-530-51243	10	Behind pressure sensor on manifold HA Pneumatic controller interface	
Sealing plate	5322-466-12073	10	For nozzles placement head HA	
Fixing eye of tie-wrap	9498-396-01394	10	Cables in control supply unit	
Hose pillar RTU-PK-3/3	9498-396-01881	6	Manifold from AQ to AX-201	
Contact pen	9498-396-00125	5	Trolley to lift electrical interface	
PCB spacer RLCBSRE-10	9498-396-01887	10	Placement head HA, transport controller in control supply	
Cable clamp	9498-396-01888	10	Base	
Cable clamp 4.8	9498-396-01889	10	Encoder cable, BA camera	
Flatcable bracket (Small)	-	5	Control supply unit	
End stop Z-lift DOWN	9498-396-01892	4	Z-lift placement head DV	
End stop Z-lift UP	9498-396-01893	8	Z-lift Placement head DV	

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A8.5.4 Lubricating tool for placement head DV and Z-lift

Placement head lubrication tool 9498-396-01954			
A	Needle (set of 6)	9498 396 01998	
B	Container	9498 396 02000	
F	Plunger		
C	Dispenser	9498 396 01999	
D	Nylon ring		
E	Flange screw		
G	Plunger arm		
H	Screw		
Grease (IKO)		9498 396 02001	
Needle guidance		9498 396 01996	

Bended needle	9498-396-02438	
---------------	----------------	--

A8.5.5 Standard materials

Description	
Fibre free tissue	Local purchase
Keyboard cleaner	Local purchase
Ethanol	Local purchase
Clean air spray	Local purchase
Vacuum cleaner with plastic attachments	Local purchase
Anti-static spray	Local purchase
Molykote metal protector	Local purchase
Loctite 243	Local purchase
Protective gloves	Local purchase
Brush soft	Local purchase
Multimeter	Local purchase

A8.5.6 Second level spare parts

Definition of second level spare parts, see [A8.5.1 Materials, definitions](#)

System controller	A8.4.1 Controllers, spares
Process controller	
Motion amplifier	A8.4.12 XY robot, spares
Placement head HA	A8.4.8 Placement head HA, spares
Placement head controller	
Manifold	
Placement head DV	A8.4.10 Placement head DV, spares
Pneumatic controller	
Placement head DV controller	
Transport amplifier	A8.4.7 Board transport, spares
Transport controller	
CV camera LFOV	A8.4.13 Vision, spares
BA camera	

Figure 82 Second level spare parts

A8.5.7 Consumables

A8.4.9 Toolbits and gripper for placement head HA
A8.4.11 Toolbits for placement head DV
A8.5.3 Maintenance kit (PA 2440/00)

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A8.6 Tools

A8.6.1 Tools, definitions

- Recommended **standard** tools
Tools that are used for general purposes during service and maintenance activities. Local purchase by the customer is expected.
 - Recommended **special** tools
Tools that are used for specific purposes during service and maintenance activities. Local purchase by the customer is expected.
 - Recommended **Assembléon** tools
Tools that are used for specific purposes during service and maintenance activities and that are available via Assembléon. Tools can be ordered separately or as part of a tool set, using the regular commercial channels.
-
- | | |
|--|--|
| <ul style="list-style-type: none"> • Description • Application • Ordering code. | <p>Name of the tool</p> <p>Indication of what purpose the tool is used for.</p> <p>The code number with which the tool or the tool-set can be ordered at your regional service center.</p> |
| <ul style="list-style-type: none"> • Identification and picture | <p>Information to identify the tool, either a picture or an identification number if applicable, or both. The last digit of an identification number indicates the version of a certain tool. The higher this digit the later the tool. The listed identification number is the minimum required version. All later versions are compatible.</p> |

A8.6.2 Tools, overview

[A8.6.6 Recommended Assembléon tools](#)

[A8.6.3 Recommended standard tools](#)

[A8.6.5 Recommended special tools](#)

[A8.6.4 Setup tooling kit \(PA 2435/00\)](#)

A8.6.3 Recommended standard tools

Quantity	Description
1	Open end/ring wrench 5 mm
1	Open end/ring wrench 5.5 mm
1 set	Open end/ring wrenches 6 - 24 mm
1	Socket screwdriver 4 mm
1	Socket screwdriver 5 mm
1	Socket screwdriver 7 mm
1	Socket screwdriver 8 mm
1	Socket screwdriver round-head 2.5 mm
1	Socket screwdriver round-head 3 mm
1	Socket screwdriver round-head 4 mm
1	Socket screwdriver round-head 5 mm
1	Allen key 0.9 mm
1	Allen key 1.27 mm
1 set	Allen key 1.5 - 10 mm
1 set	Allen wrenches (short)
1 set	TORX screwdrivers T7 - T40
1	Screwdriver TORX T6
1	Screwdriver TORX T7
1	Screwdriver TORX T10
1	Screwdriver TORX T15
1	Screwdriver no. 1 insulated
1	Screwdriver no. 2 insulated
1	Screwdriver no. 3 insulated
1	Screwdriver no. 4 insulated
1	Screwdriver no. 5 insulated
1	Screwdriver no. 4 short
1	Screwdriver no. 4 square
1	Screwdriver clamping M2 - M3.5
1	Screwdriver clamping M3.5 - M5
1 set	Precision screwdrivers
1	Phillips screwdriver no. 0
1	Phillips screwdriver no. 1
1	Phillips screwdriver no. 2
1	Measuring tape 2 meter
1	Calliper gauge 150 mm
1 set	Feeler gauges 0.03 - 0.5 mm
1	ESD-set
1	Multi meter

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A8.6.4 Setup tooling kit (PA 2435/00)

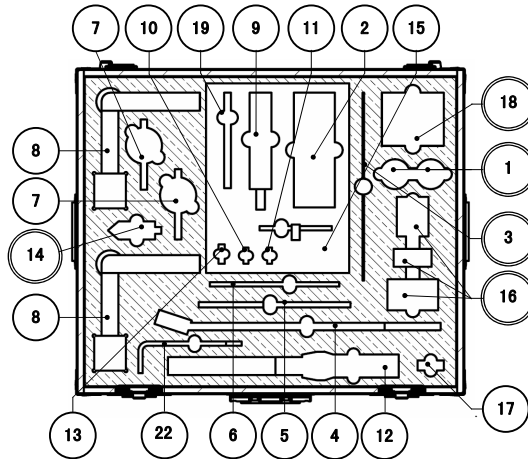


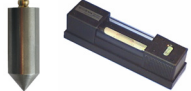

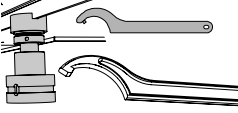

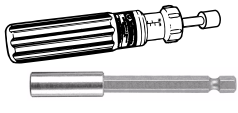


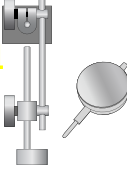
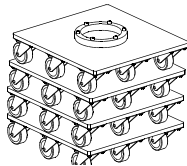


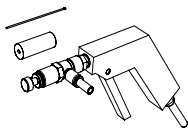
Figure 83 Setup tooling kit , contents

Item	Description	Qty	Ordering code	Application	Identification and picture
1	Calibration nozzle	2	5322-360-10311	Calibration, placement head HA	
18	Nozzle set 5 x L8	1	9498-396-01874	Calibration, placement head DV	
2	Spirit level	1	9498-396-00097	Levelling	
14	Plumb line	1	-	Positioning	
4	Open ended spanner 36 mm	1	9498-396-00037	Levelling, mounting on crate bottom	
5	Hook spanner 68-75	1	9498-396-00035		
16	Levelling jig	1	9498-396-02082	Machine levelling (Hook spanner 68-75 is item 5)	
6	Hook spanner 45-50	1	9498-396-02078		
12	Torque wrench 10-100 Nm	1	9498-396-02079		
17	Bit holder insert tool	1	9498-396-02080		
13	Hex bit 8 mm	1	9498-396-02081		
9	Torque screw driver 0-6 Nm	1	9498-396-02084		
19	Extended bit holder 150 mm	1	9498-396-02085		
11	Ball hex 4	1	-		
10	Ball hex 3	1	-		
22	Panel removal key	1	9498-396-02083		
3	Transport calibration plate	1	5322-466-11588	Calibration	
7	Clock gauge	2	9498-396-00181	Levelling, range 10 mm, accuracy 0.01 mm. Support	
8	Measuring support	2	9498-396-00182		



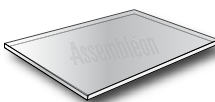
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A8.6.4.1 Setup tooling, optional tools



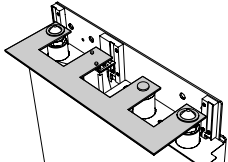
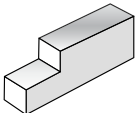

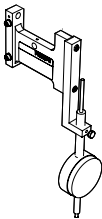
Description	Ordering code	Application	Identification and picture
Installation wheel set	9498 396 00145	Set of 4 lorries for manual machine transportation.	4022 510 1763 

Description	Ordering code	Application	Identification and picture
Placement head cleaning tool	9498-396-00558		

A8.6.5 Recommended special tools

Description	Application	Picture
Power supply (24 Volt, 5A)	Used when the trolley will not come down from the base	
Belt tension gauge (Range 50-250 Hz, accuracy 2Hz).	Corrective maintenance: belt tension check after Z-motor, Z-belt, X-motor and X-belt replacement.	
Mirror	Adjusting board sensors	

A8.6.6 Recommended Assembléon tools

Description	Ordering Code	Application	
Wrist band ESD	2622-890-98277		
Spiral coard	2622-890-98352		
Adjustment plate	9498-396-00118	Trolley lift	
Plastic feeler gauge	5322-395-10673		
Trolley extension cable	5322-218-11886		
Encoder tester	5322-395-10773		
Y-calibration tool, A-series trolley	9498-396-00857		
Z-calibration tool, A-series trolley	9498-396-00856		
Suspension beam	5322-535-10577		
Suspension bracket	5322-395-10843		
Carrier detection adjustment tool	5322-395-10841		
Adjustment carrier	5322-466-11767		
Adjustment ring 20 mm	5322-532-12917		
Adjustment ring 26 mm	5322-532-12918		
Assy strip	9498-396-00980		
Extension cable 2, A-series trolley	9498-396-00859		
Extension cable 1, A-series trolley	9498-396-00858		
Gauge board Transport	5322-395-10639	Board transport	
Height block	5322-466-11589	Board transport	
Special wrench	5322-395-10638		
Dial gauge holder Z=0	9498-396-00157	Gauge included	
Lift plate feeder bank	4022-532-06401		
X-Y calibration kit	5322-466-11608	Required for XY robot calibration	
Torque meter (5 N)	5322-395-10692	Required for Placement Head	
Torque meter (20N)	5322-395-80388	Required for Placement Head	
Belt tension indicator	5322-395-10704	Required for Service Kit Feeding	

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B. BASE

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CHAPTER B1 Introduction

B1.1 General

The base contains controllers, electronics, wiring etc.

On the base, board transport, various trolleys and the various placement heads can be mounted. All electrical and moving components are safely placed behind protection covers.

B1.2 Survey

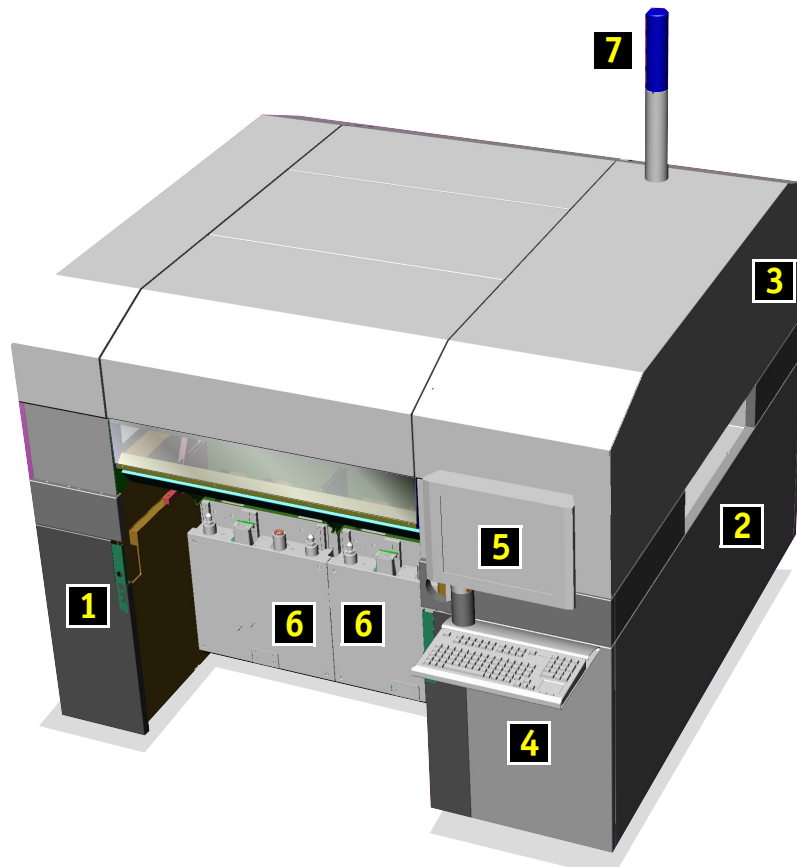


Figure 1 AX-201 base

Content of this part:

1. Base
2. Control supply unit
3. Air supply unit
4. System and process controller
5. User interface
6. Trolley lift
7. Lamp post.

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CHAPTER B2 Safety and ergonomics

The base is part of the whole machine.

Safety and ergonomics is only described for the machine as a whole.

See [CHAPTER A2 Safety](#) .

CHAPTER B3 Specifications

B3.1 Trolley lift, identification

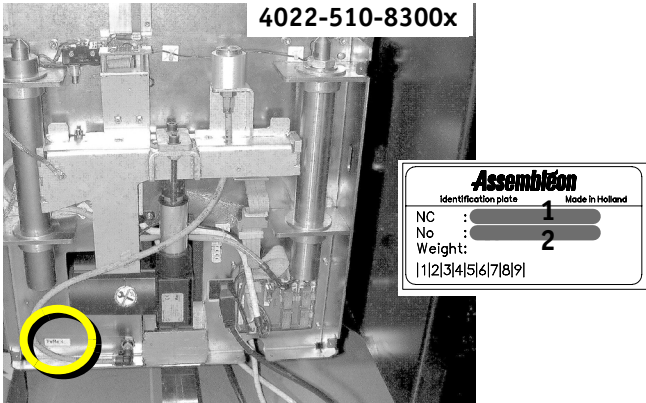


Figure 2 Trolley lift, identification

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Serial number	6 digit production code

Figure 3 Trolley lift, identification

CHAPTER B4 Functional description

B4.1 Base

The frame is a welded sheet steel assembly resulting in a stiff construction.

The base is height adjustable, to meet the production environment according to JIS and SMEMA standards.

The frame has accurate interfaces to the XY robot (1), the board transport (2) and the trolley lifts (3).

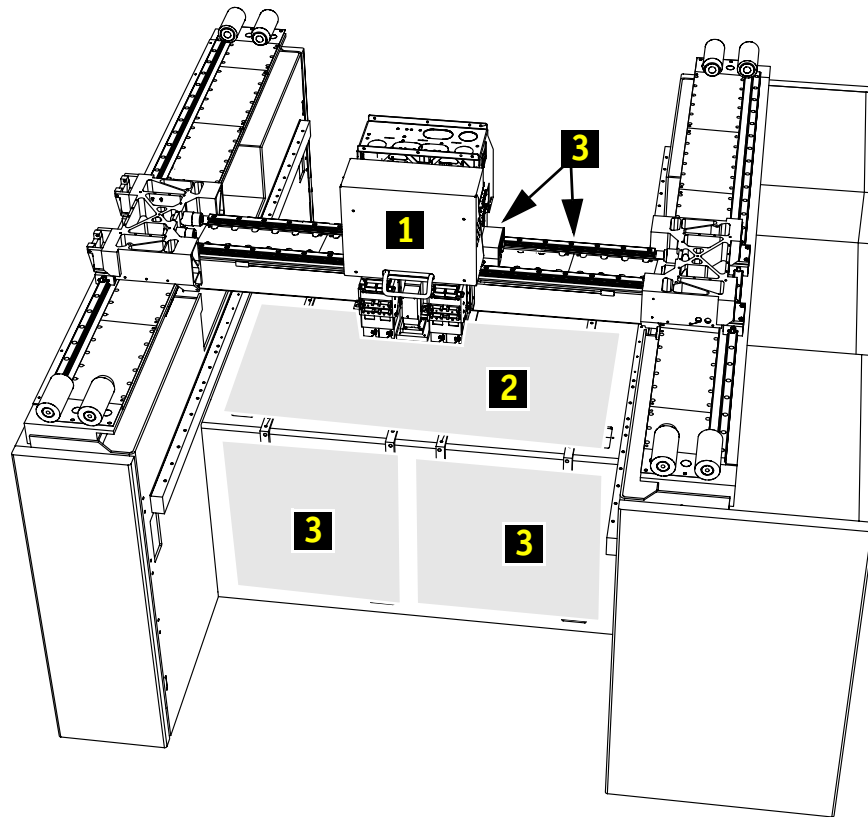


Figure 4 Base with XY robot

1. XY robot (part of the base).
2. Board transport interface.
3. Trolley lift interface.

B4.2 Mains supply

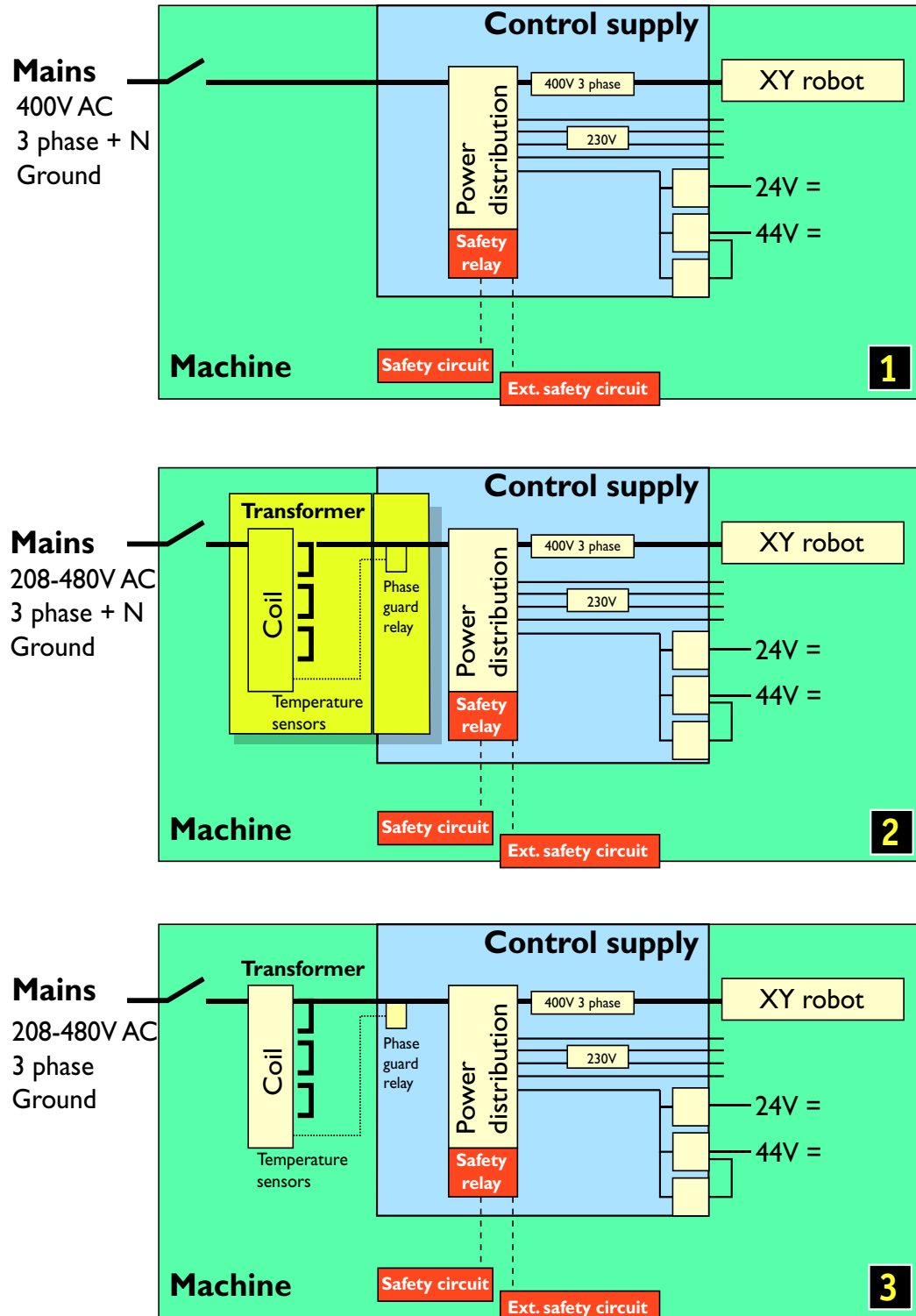


Figure 5 Mains supply, schematic diagram

1. Machine (PA2410/01) without transformer.
2. Machine (PA2410/01) with optional transformer (PA 1124/10).
3. Machine with standard transformer (PA2410/00).

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■ Mains

This is the factory nominal supply voltage. The machine needs 3-phase power input that ranges from 208 to 480V. Required frequency is 47 - 63 Hz.

■ Mains supply

Via the tab settings the applicable supply voltage can be set to 208, 230, 400 or 480V. A three-phase transformer converts the supply voltage into the required output. A phase guard relay is used to control the supply voltage.

A safety relay is used to ensure a safe status of the machine.

■ Power output	Target
• 400V (3-phase)	XY robot
• 230V	Controllers Touch screen(s) Trolley lifts 24V power supplies Safety relays.
• 48V (44V)	Transport controller Placement head controllers Tray trolley Auxiliary feeding connections
• 24V	XY robot Placement head controllers Transport controller Auxiliary feeding connections BA cameras CA cameras I/O module.

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B4.2.1 Safety relay (K6)

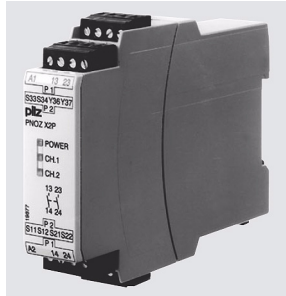


Figure 6 Safety relay

The kernel of the safety circuit is the safety relay (K6), immediately cutting of the power to the servo motors (motion) if one of the following events occurs:

- A front or rear cover is lifted.
- One of the emergency stop buttons is pushed.
- A trolley is lowered, or a safety cover is missing.

B4.2.2 Phase guard relay (K7)

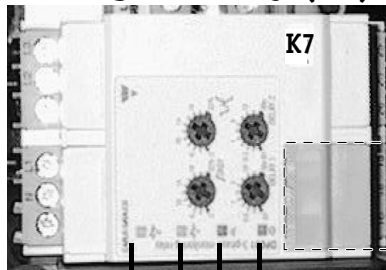


Figure 7 Phase guard relay

The phase guard relay (K7) interrupts the mains power supply when:

1. The phase sequence is incorrect.
2. Any phase is missing.
3. A voltage drop >20%
4. Asymmetry fault > 20%
5. Mains frequency exceeds 47-63 Hz.
6. The temperature of the transformer coils inside the main supply unit exceeds the maximum allowed temperature (3 sensors).

B4.2.3 Digital I/O

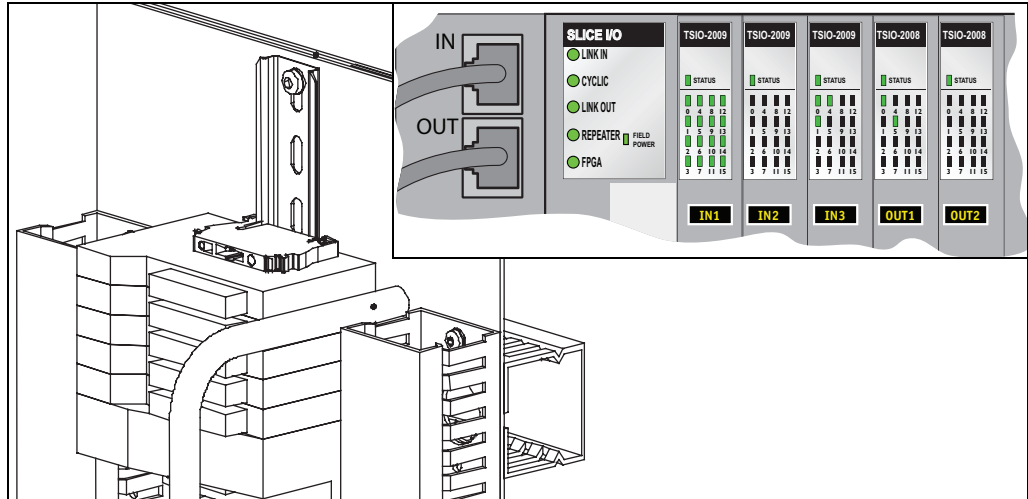


Figure 8 I/O module

The digital I/O module handles data to and from the controllers:

- Lamp post
- Safety circuit
- Air supply
- Auxiliary feeding
- Verification tool
- Bitbus nodes
- Feeder sections
- Fluxer (optional).

B4.2.4 Power on relay



Figure 9 Power on relay

When the phase guard relay (K7) detects a problem, the power on relay (K1) cuts off all power to the transport controller and to the electrical distribution rail.

B4.3 Air supply unit

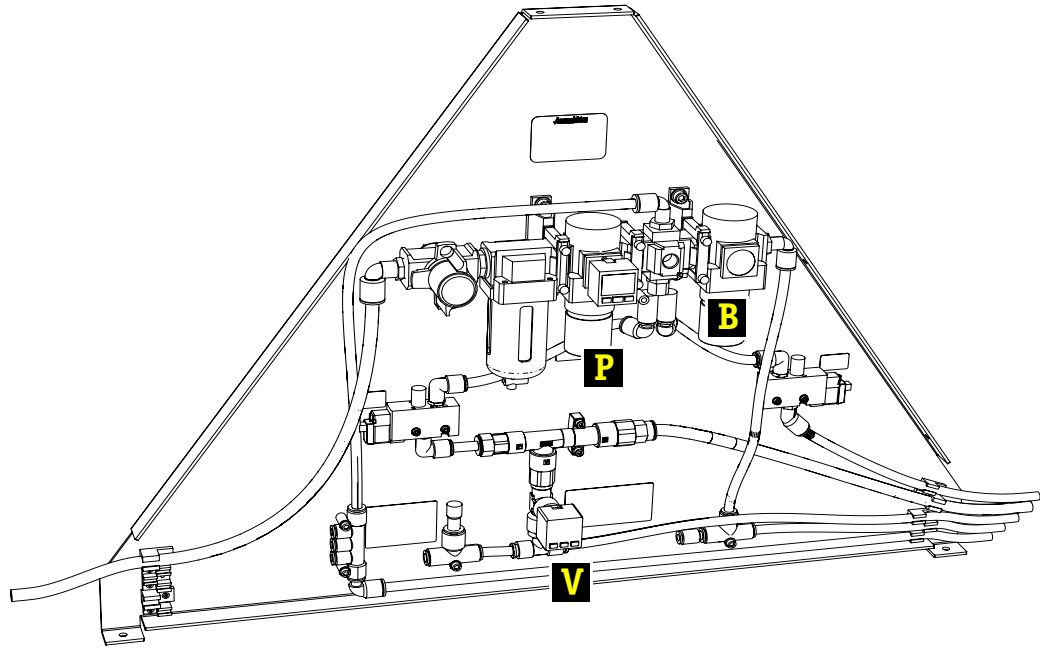


Figure 10 Air supply unit

The air supply unit is divided in tree parts:

1. Pressed air (P) for both the placement heads DV and HA.
2. Blower air (B) for the placement heads HA.
3. Vacuum (V) for the placement heads HA.

B4.3.1 Air and vacuum, diagram

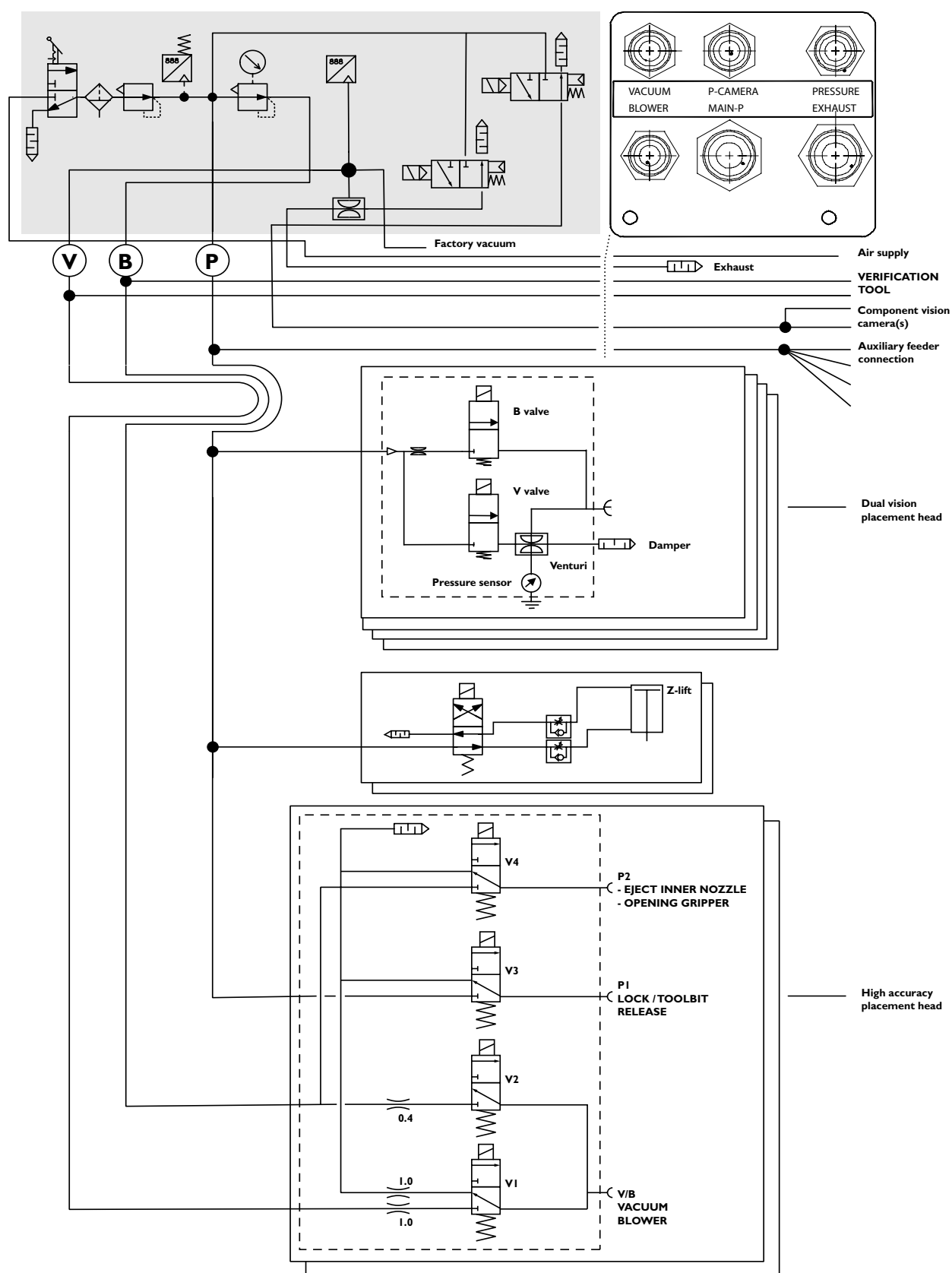


Figure 11 Air and vacuum diagram

B4.4 Controllers, overview

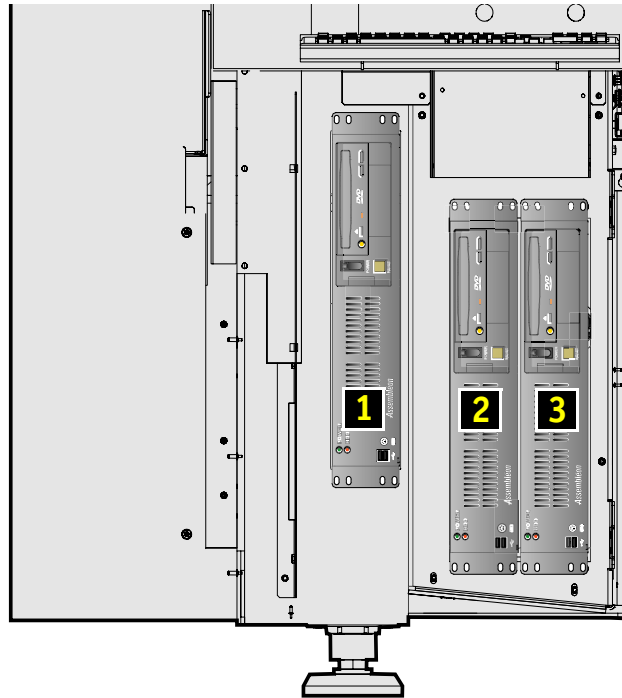


Figure 12 Controllers, mounted in the base

1. SVS Pro controller, see [B4.4.1 SVS Pro controller](#)
2. Process controller, see [B4.4.2 Process controller](#)
3. System controller, see [B4.4.3 System controller](#)

B4.4.1 SVS Pro controller

The SVS Pro controller is an industrial computer supplied with a CAN card. This controller is responsible for communication with the feeder sections and SVS Pro scanner.

B4.4.2 Process controller

The process controller is an industrial computer, responsible for:

- The communication between transport controller, placement modules, XY robot and feeding modules.
- All I/O checks.
- Collecting MIS data.

B4.4.3 System controller

The system controller is an industrial computer, responsible for:

- Management of placement programs and process data.
- Interfacing with external systems.
- Hosting calibration values.
- Controlling the user interface peripherals.
- SVS Pro and BTCO communication.
- Analyse and presenting MIS data.
- Providing the graphical user interface (keyboard, touch screen).

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B4.5 Touch screen(s), keyboard

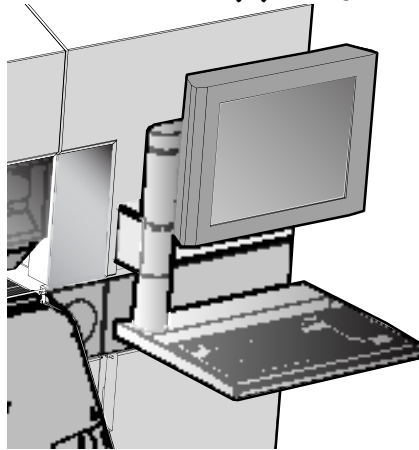


Figure 13 Touch screen and keyboard

During production the machine (system controller) can be operated using only the touch screen at the front or rear (optional).

For entering single line text or numeric values a keyboard is provided.

The keyboard has an integrated pointing device that can be used in case of a malfunction of the touch screen.

The information panels and dialogues all support keyboard control.

B4.6 Lamp post

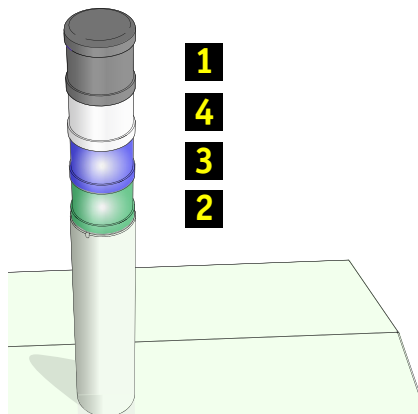


Figure 14 Lamp post

The lamp post represents the actual status of the machine, and is controlled by the process controller via the I/O module.

1. Beeper: Acoustic warning signal
2. Green: Running production
3. Blue: Intervention of operator required
4. White: Machine in idle

B4.7 Trolley lift

The trolley lift forms the interface between the base and a trolley or a trolley lift cover. Trolley lifts are located at the front side of each trolley slot.

The trolley is picked up at the two upper mechanical interfaces (1). A trolley is lifted from the floor to eliminate floor irregularity. The lower mechanical interface (2) ensures a correct positioning of the trolley in Y-direction. The lift is moved by an electrical actuator. The base supplies 230 VAC to the power converter of the trolley lift.

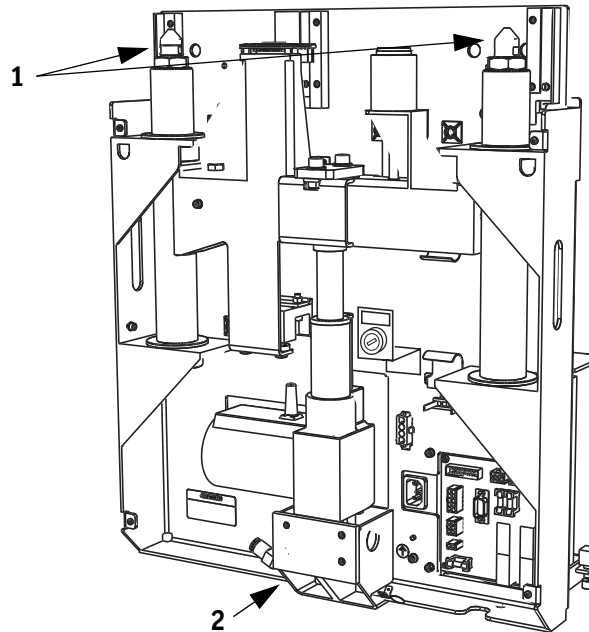


Figure 15 Trolley lift 4022-510-8300x

■ Trolley lift functionality when a trolley is lifted:

1. The trolley is pushed against the trolley lift, the electrical circuit in the trolley lift is closed via the slide contacts on the trolley lift and the electrical spring contacts in the trolley.
2. The 'up' control on the trolley is activated (by the user).
3. Relay K1 activates the trolley lift actuator to move upward.
4. The electrical contacts on the base interface board and the trolley interface board are connected.
5. The safety interlock on the trolley lift closes the safety circuit (for details about the safety circuit see system wiring).
6. The micro switch in the trolley lift is activated.
7. The micro switch stops the actuator.
8. The micro switch closes the power circuit to the trolley (2 times 24 VDC).

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■ Trolley lift functionality when a trolley is lowered:

1. The 'down' control on the trolley is activated (by the user).
2. Relay K2 activates the trolley lift actuator to move downward.
3. The micro switch in the trolley lift is deactivated.
4. The micro switch interrupts the power circuit to the trolley (2 times 24 VDC).
5. The safety interlock on the trolley lift interrupts the safety circuit (for details about the safety circuit see system wiring).
6. The electrical contacts on the base interface board and the trolley interface board are disconnected.
7. The mechanical interfaces between the trolley lift and the trolley are disconnected, the trolley can be removed from the trolley lift.
8. The trolley lift keeps moving downward until the endswitch in the actuator is activated.

B4.8 Trolley lift cover

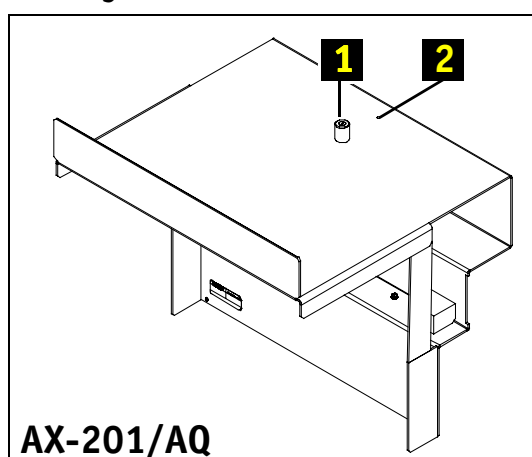


Figure 16 Trolley lift cover

The trolley lift cover is designed to enable safe operation of the machine when no trolley is available for a trolley slot. The switch on the trolley lift cover activates the trolley lift thereby closing the safety circuit (see chapter A5).

The trolley lift cover is designed for AX-201 and for AQ as well. Mount the marker for AX-201 on position 2. (Position 1 is for AQ).

CHAPTER B5 Troubleshooting

B5.1 Troubleshooting workflow

The troubleshoot chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.



NOTE: Using the electronic version of the manual will enable the user to use hyperlinks and the 'back' button in the browser to navigate quickly through the information in separate paragraphs.

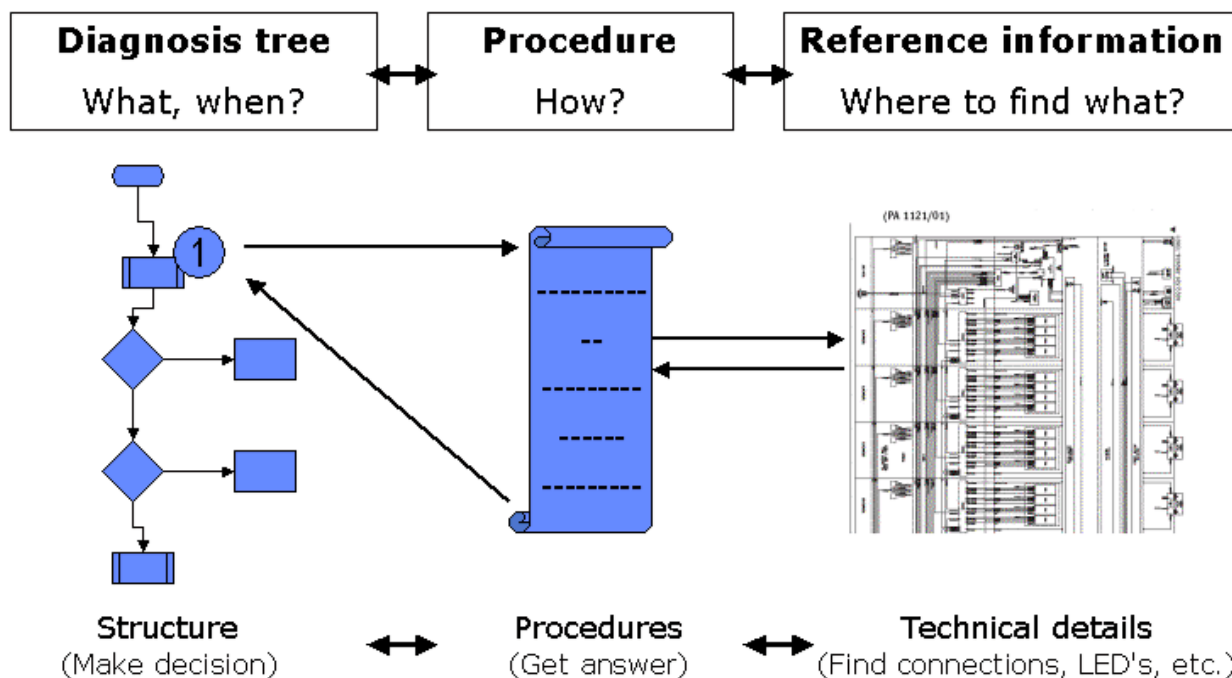


Figure 17 Visual structure of chapter 5

B5.2 Diagnosis trees and tables

B5.2.1 Diagnosis trees, conventions

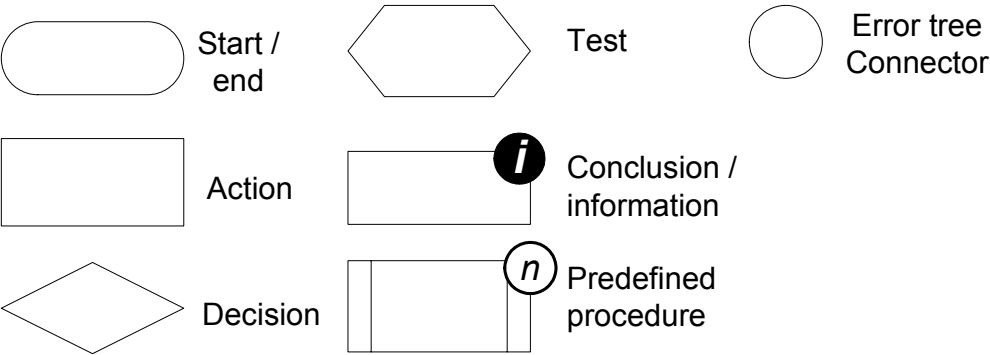
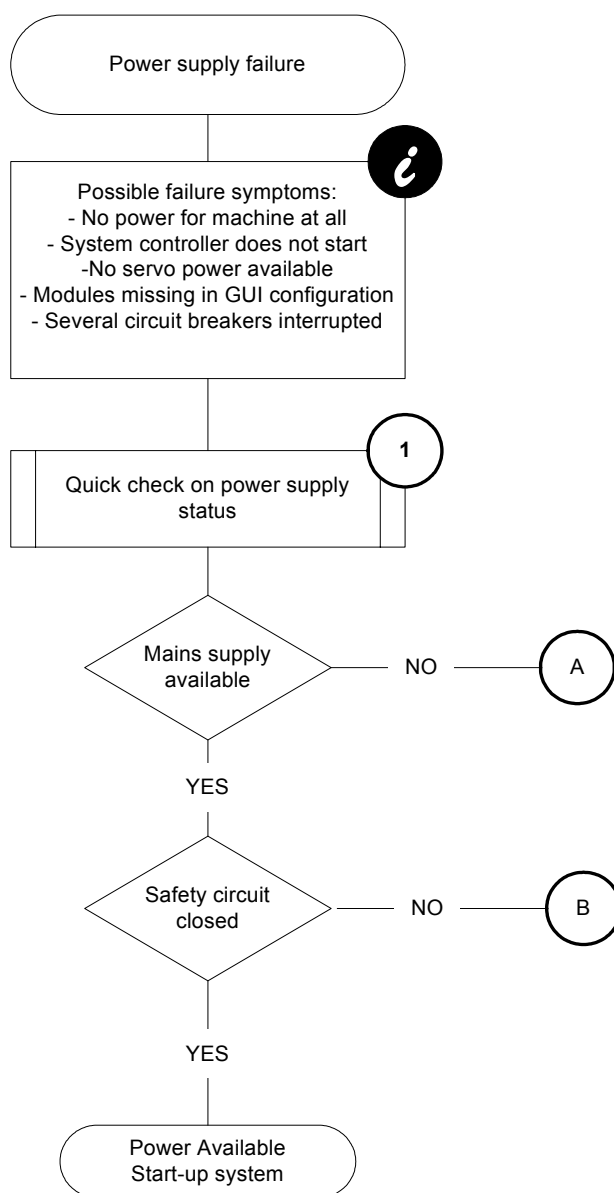


Figure 18 Error trees, conventions

B5.2.2 Mains power supply, diagnosis tree

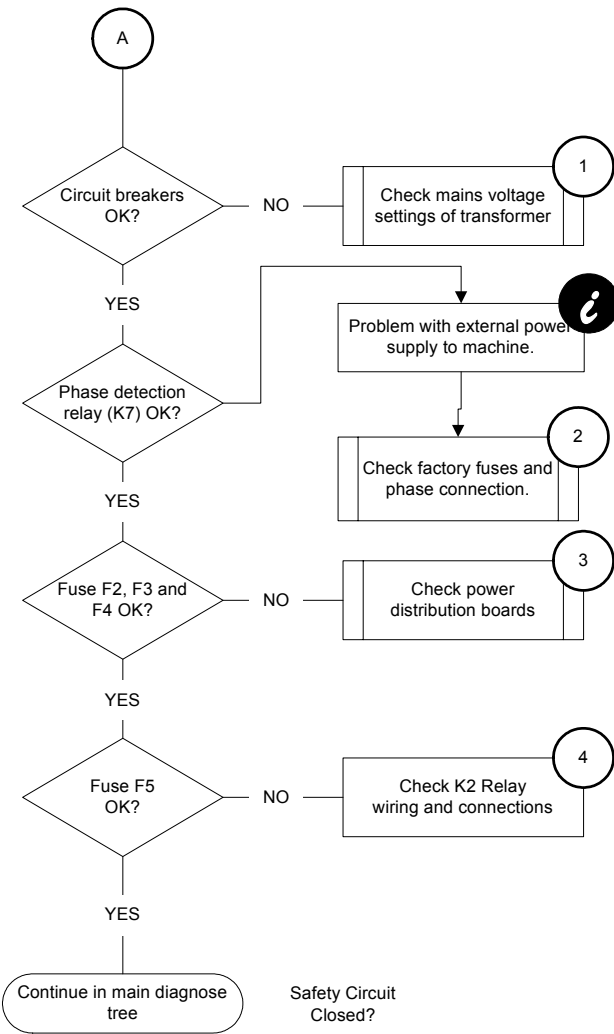


Reference:

1.B5.2.2.1 Power supply,
quick check on status

Figure 19 Mains power supply, diagnosis tree

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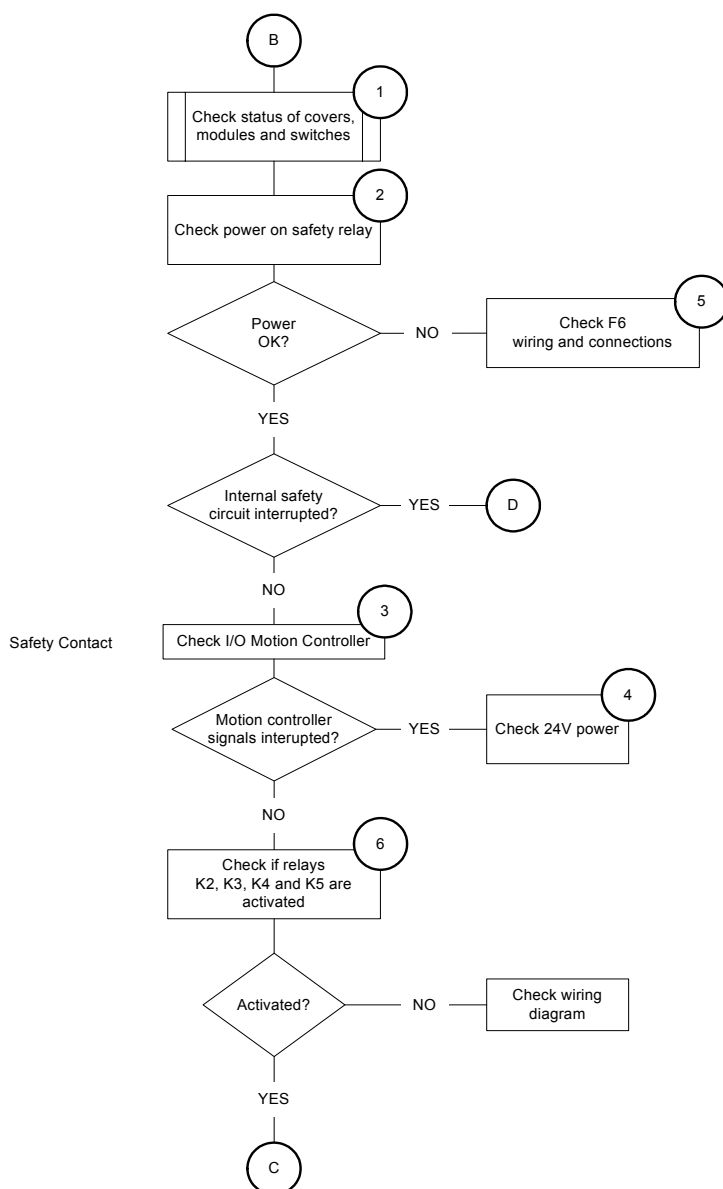


Reference:

- 1. See installation manual
- 2. [B5.2.2.2 Mains voltage, checking settings](#)
- 3. [B5.3.9.3 Power board, connections](#)
- 4. [B5.3.9 Mains supply PA 2410/00, features](#)

Figure 20 Mains power supply, diagnosis tree A

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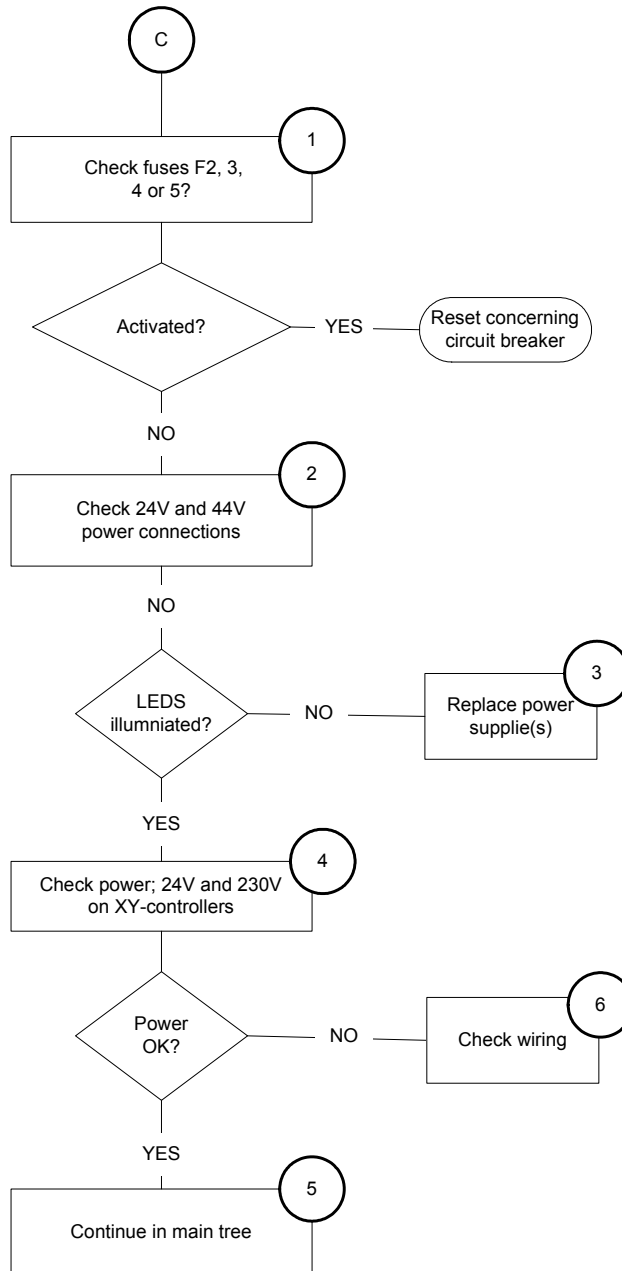


Reference:

1. B5.2.2.4 Covers, modules and switches, status check
2. B5.3.9.2 Safety relay (K6), features
3. B5.3.9.4 Digital I/O, LED signalling
4. B5.4 Diagrams
5. B5.3.9 Mains supply PA 2410/00, features
6. B5.3.9 Mains supply PA 2410/00, features

Figure 21 Mains power supply, diagnosis tree B

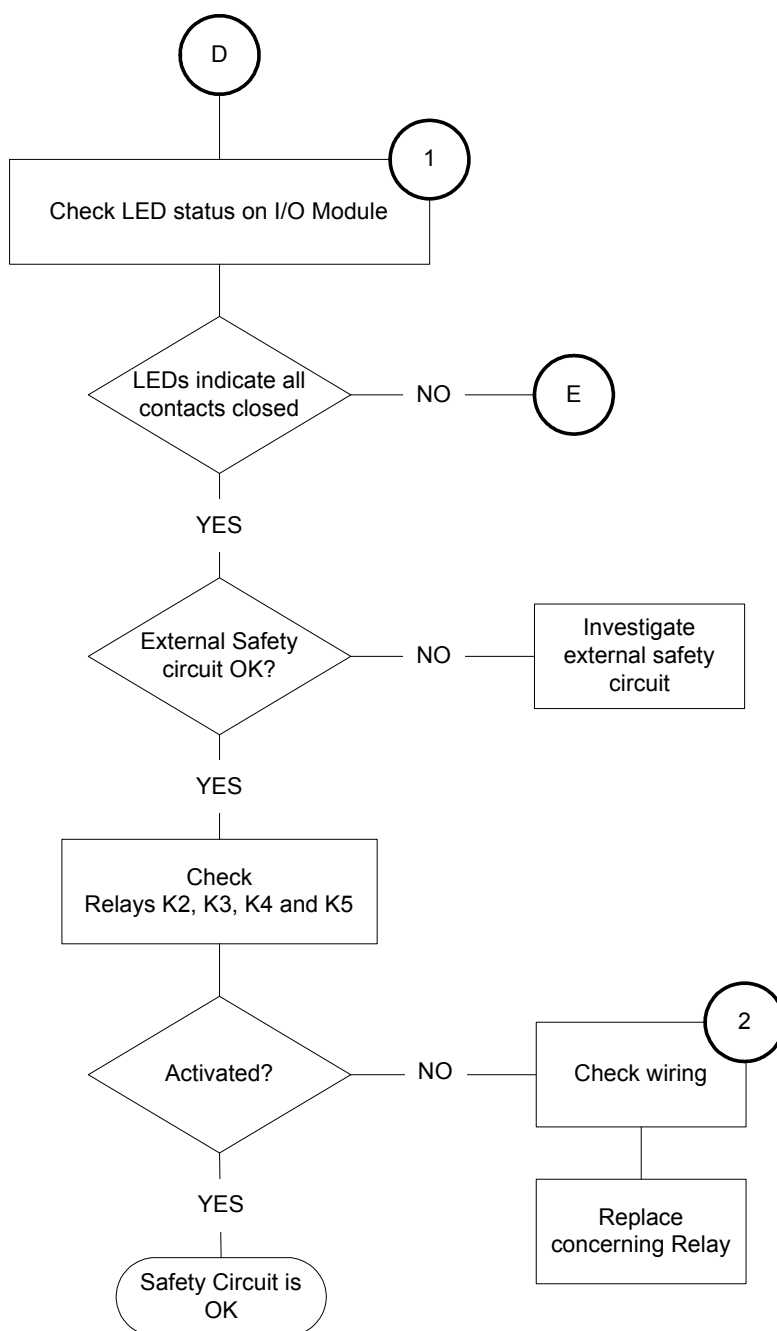
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Reference:

1. [B5.3.9 Mains supply PA 2410/00, features](#)
2. [B5.3.11 Interconnection board base, fuses and LED signalling](#)
3. [B8.21 Power supply units 22-24V, replacement](#)
4. [B5.2.2.9. XY robot, power supply check](#)
5. [Figure 19. Mains power supply, diagnosis tree](#)
6. [B5.4 Diagrams](#)

Figure 22 Mains power supply, diagnosis tree C

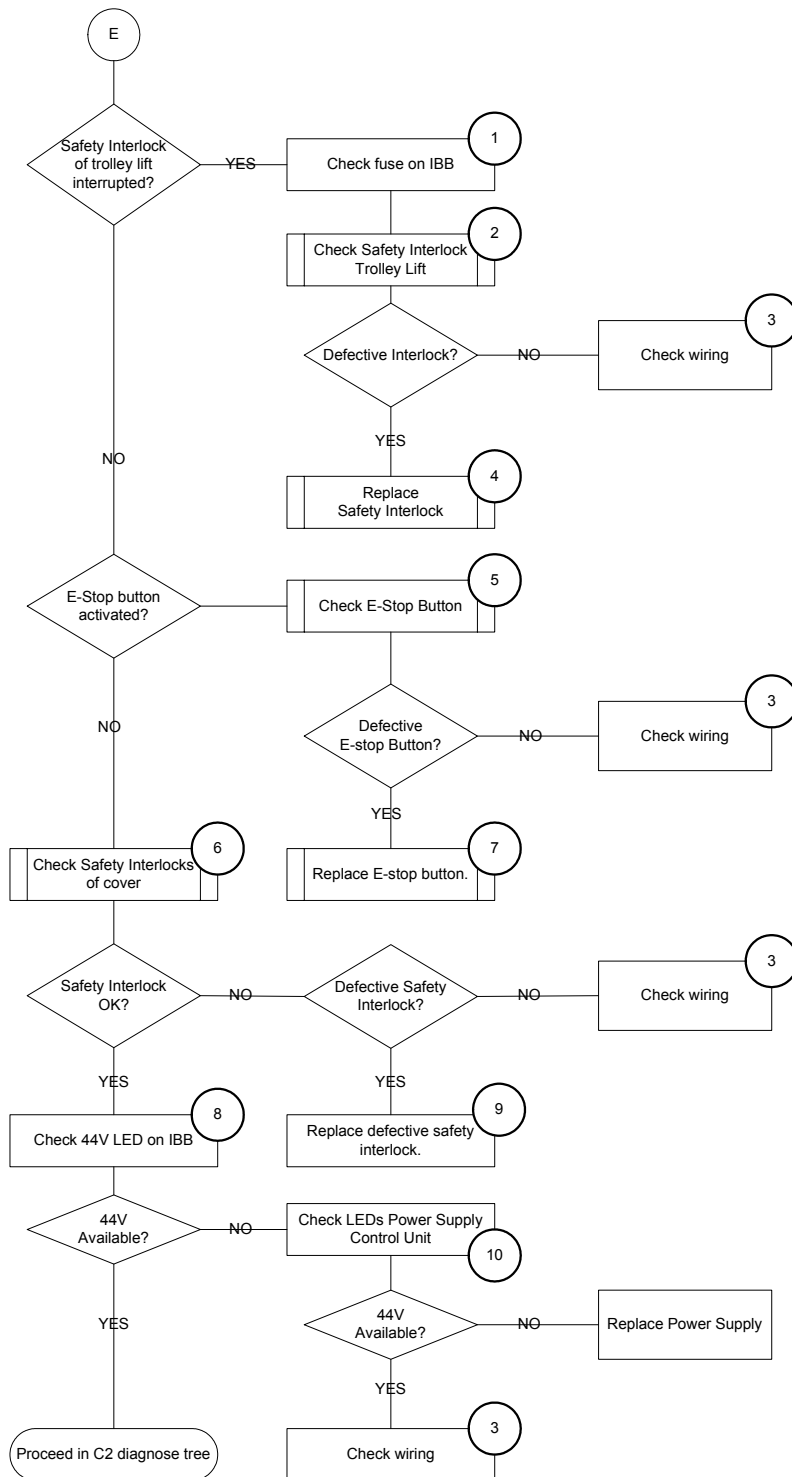


Reference:

1. B5.2.2.5. I/O LED status check
2. B5.4 Diagrams

Figure 23 Mains power supply, diagnosis tree D

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Reference:

1. B5.3.11 Interconnection board base, fuses and LED signalling
2. B5.2.2.6. Safety interlock of trolley lift, check
3. B8.22 Emergency stop buttons, replacement
4. B5.2.2.7. Emergency stop button, check
5. B5.2.2.8. Safety interlock of cover, check
6. B8.22 Emergency stop buttons, replacement
7. B8.17 Safety interlocks on front and rear hood, replacement
8. B5.3.11 Interconnection board base, fuses and LED signalling
9. B5.3.9 Mains supply PA 2410/00, features
10. B5.3.11 Interconnection board base, fuses and LED signalling
11. B5.4 Diagrams

B5-00002.fm

B5.2.2.1 Power supply, quick check on status



DANGER, HIGH VOLTAGE PRESENT DURING TEST

Contact may cause electric shock or burn.

Avoid contact with any 'live' circuits or use proper insulated tools.

Check the power supply status in the following order:

1. Status on mains supply:

Open the rear door to access the mains supply.

- Phase check on incoming power OK: LEDs of phase detection relay (K7) = 2 x yellow LED, 1 x green LED, no red (blinking) LED?
- 24 V power supplies OK: Led on 24 Volts power supplies illuminated?
- **ALL** circuit breakers **NOT** interrupted?
- Is the safety circuit closed: LED CH.1/CH.2 on safety relay (K6) illuminated ?

For more information on the LED indications of the modules, refer to [B5.3.9 Mains supply PA 2410/00, features](#)

B5.2.2.2 Mains voltage, checking settings



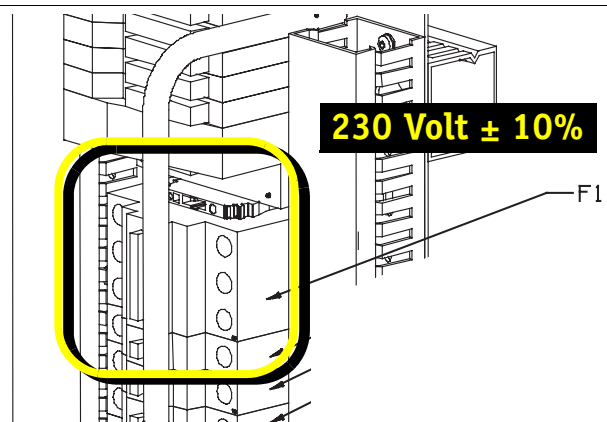
DANGER, HIGH VOLTAGE PRESENT DURING TEST

Contact may cause electric shock or burn.

Avoid contact with any 'live' circuits or use proper insulated tools.

1. Power supply check on F1,2,3,4,5,6

- Check if the circuit breakers are switched off.
- Switch on the electrical main switch.
- Check the voltage ($230V \pm 10\%$) on F1 between **each** phase and ground.
- If not OK, refer to 'Trafo strapping in installation manual' or [B6.3 Mains power supply voltage, adapting](#) .

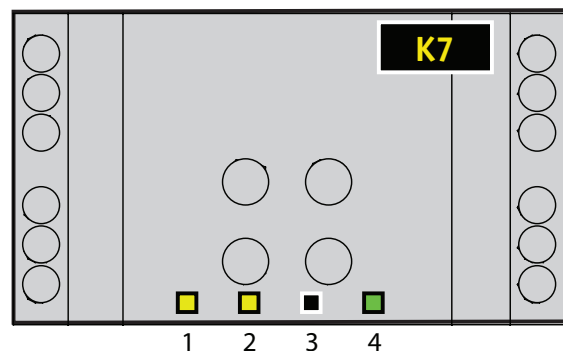


2. Switching on

- Switch on circuit breaker F1 in the mains supply unit.
- Set the main switch to on.
- Check phase guard relay, see [B5.3.9.1 Phase guard relay \(K7\), features](#)
- LED 1,2 and 4 must be on.

Note: The phase-detection LED (3) on the phase guard relay (K1) must be off, indicating that the three phases are present.

- If the LED (3) is on, interchange two phases on the connectors L1 to L3 at the main switch. See [B5.2.2.3](#).



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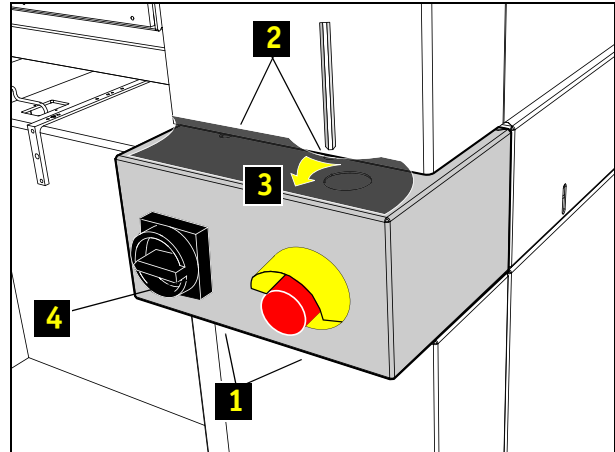
B5.2.2.3 Power supply, interchange two phases

1. Prerequisites

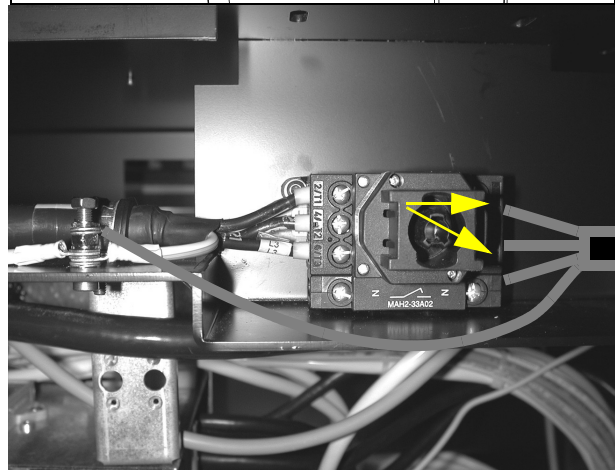
- Turn off and lock factory fuses that supply power to the machine.
- Turn off main switch.

2. Removing the panel, rear

- Remove the two bolts (1) from underneath.
- Loosen the two bolts (2) on top, turn over the cover (3),
- Turn the mains switch (4) in the 'OFF' position and put the cover aside.
- Remove the two bolts and take the assembly off (this can only be done when the main switch is in the 'off' position).



3. Interchange 2 phases



4. Finalize

- Finger-tight the electrical main switch assembly.
- Mount the factory fuses.
- Check the mains, see [B5.2.2.2. Mains voltage, checking settings.](#)
- Mount the mains switch cover.
- Push the electrical main switch assembly against the panel and tighten it.

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B5.2.2.4 Covers, modules and switches, status check

Check if all the components that normally trigger the safety circuit have a 'safe' status:

- Front cover closed, two safety interlocks.
- Rear cover closed, two safety interlocks.
- Emergency stop button released (2x).
- Trolleys present.
- Trolley lift covers present (optional).

B5.2.2.5 I/O LED status check

Open the rear door of the base. Check LED status on the I/O module to verify if the circuit is interrupted,

see [B5.3.9.4 Digital I/O, LED signalling](#)

B5.2.2.6 Safety interlock of trolley lift, check

Open the rear door of the base. Check LED status on the I/O module to verify if the circuit is interrupted,

see [B5.3.9.4 Digital I/O, LED signalling](#)

Check the connections on the interconnection board base X25, 29, 33,37 see [B5.3.11 Interconnection board base, fuses and LED signalling](#) .

B5.2.2.7 Emergency stop button, check

Open the rear door of the base. Check LED status on the I/O module to verify if the circuit is interrupted,

see [B5.3.9.4 Digital I/O, LED signalling](#)

Check the connections interconnection board base X11 (front) and X12 (rear), see [B5.3.11 Interconnection board base, fuses and LED signalling](#) .

B5.2.2.8 Safety interlock of cover, check

Open the rear door of the base. Check LED status on the I/O module to verify if the circuit is interrupted,

see [B5.3.9.4 Digital I/O, LED signalling](#)

Check IBB X13, X14, X57 and X58, see [B5.3.11 Interconnection board base, fuses and LED signalling](#)

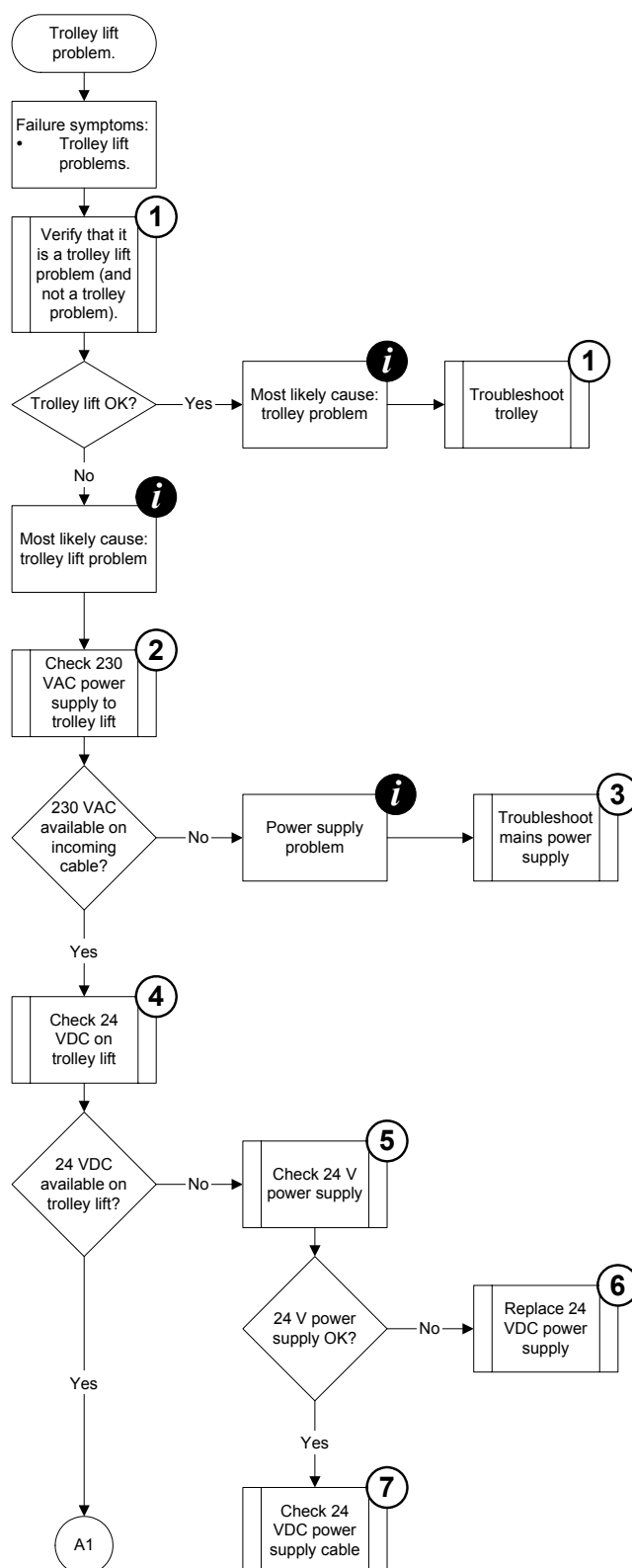
B5.2.2.9 XY robot, power supply check

Check if relay K2 and K3 are activated.

Check the 24V fuse F14 on the interconnection board electrics, see [B5.3.15 Interconnection board electrics, connections](#) .

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B5.2.3 Trolley lift, diagnosis tree

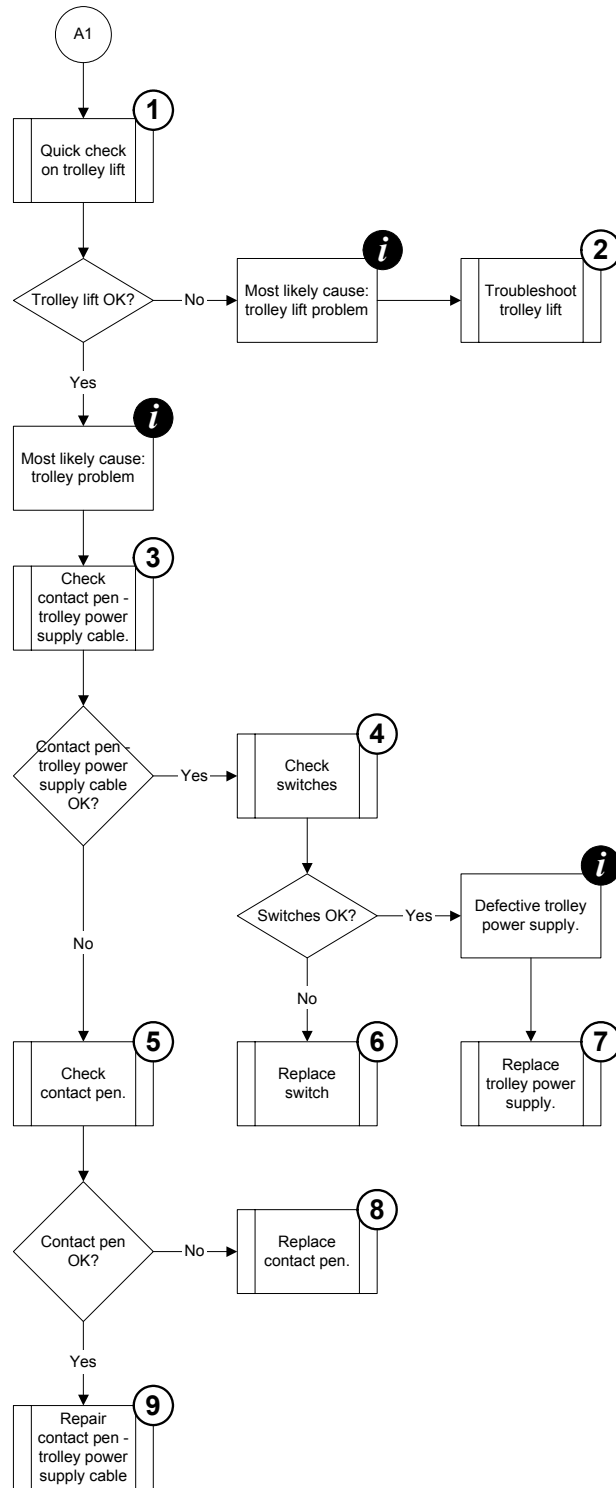


Reference:

1. [B5.2.4 Trolley lift, lifting and lowering diagnosis tree](#) .
2. .
3. [B5.2.2 Mains power supply, diagnosis tree](#)
4. [B5.2.3.2. Check 24 VDC on trolley lift.](#)
5. [B5.2.3.3. Check 24 V power supply.](#)
6. [B8.15.1.9 Power supply 24V on trolley lift, replacement](#) .
7. [B5.4.1 Trolley lift, diagram](#) .

Figure 24 Trolley lift, diagnosis tree 1

B5-00003.fm



Reference:

1. B5.2.3.4. Check trolley lift controller polyfuse
2. B8.15.1.10 Trolley lift controller, replacement
3. B5.2.3.5. Check service switch
4. B8.15.1.11 Switch on trolley lift, replacement
5. B5.2.3.6. Check trolley blue controller
6. B8.15.1.10 Trolley lift controller, replacement
7. B5.2.3.7 Check voltage polarity / voltage level
8. B8.15.1.10 Trolley lift controller, replacement
9. B8.15.1.7 Actuator on trolley lift, replacement

Figure 25 Trolley lift, diagnosis tree 2

B5.2.3.1 Check 230 VAC power supply to trolley lift

1. Disconnect the 230 VAC power cable from the trolley lift.
2. Measure the incoming voltage level on the cable.
 - 230 VAC is OK.

B5.2.3.2 Check 24 VDC on trolley lift

1. Measure the voltage level between the 'common' connection and ground, see [B5.4.1 Trolley lift, diagram](#) .
 - 24 VDC is OK.

B5.2.3.3 Check 24 V power supply

On the trolley lift controller, measure the voltage level on LU-X10 between pin 1 and 4. See [B5.4.1 Trolley lift, diagram](#) .

- 24 VDC is OK.

B5.2.3.4 Check trolley lift controller polyfuse

On the trolley lift controller, measure the voltage level on LU-X5 between pin 1 and ground. See [B5.4.1 Trolley lift, diagram](#) .

- 24 VDC is OK.

B5.2.3.5 Check service switch

On the trolley lift controller, measure the voltage level on LU-X5 between pin 2 and ground. See [B5.4.1 Trolley lift, diagram](#) .

- 24 VDC is OK.

B5.2.3.6 Check trolley lift controller

On the trolley lift controller, measure the voltage level on LU-X6 between pin 1 and 2. See [B5.4.1 Trolley lift, diagram](#) .

- + or - 24 VDC is OK.

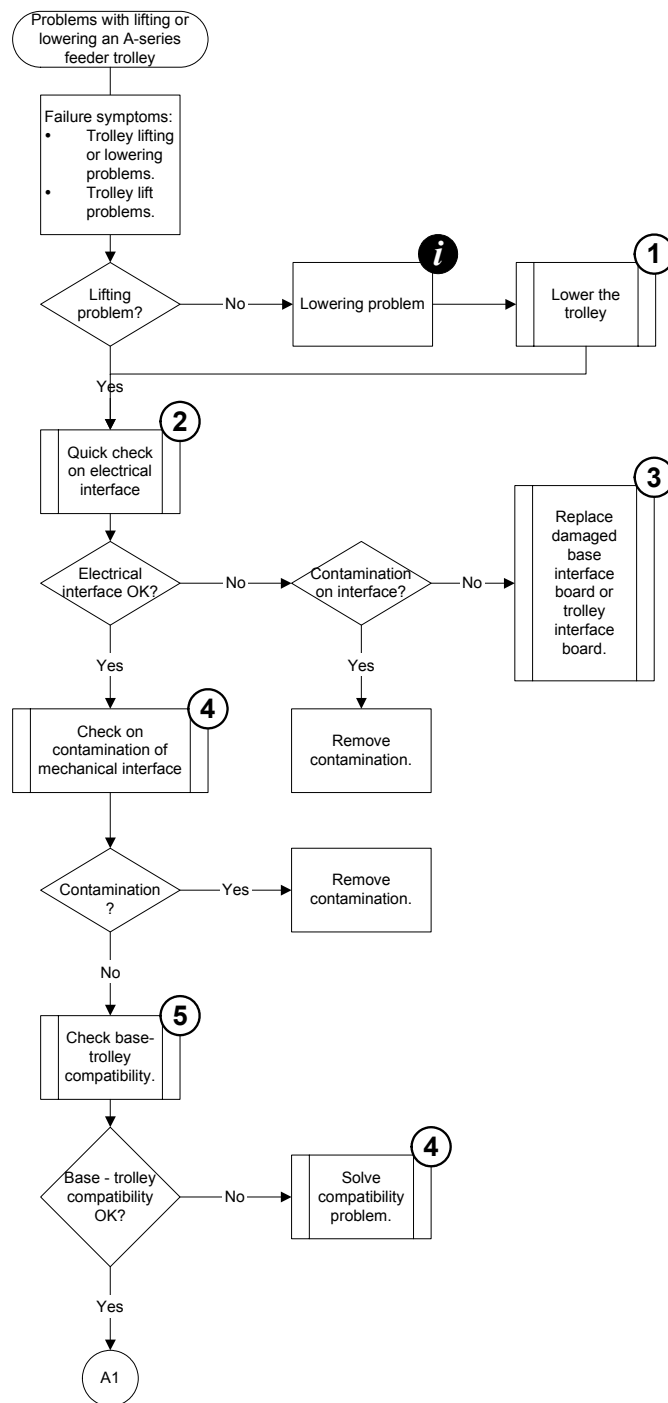
B5.2.3.7 Check voltage polarity / voltage level

On the trolley lift controller, measure the voltage level on LU-X6. See [B5.4.1 Trolley lift, diagram](#) .

While the 'common' and 'up' connections on the trolley lift (see [B5.4.1 Trolley lift, diagram](#)) are interconnected, measure the voltage level and polarity between pin 1 and 2.

- The measured voltage level should have a different polarity than in [B5.2.3.6](#).
- + or - 24 VDC is OK.

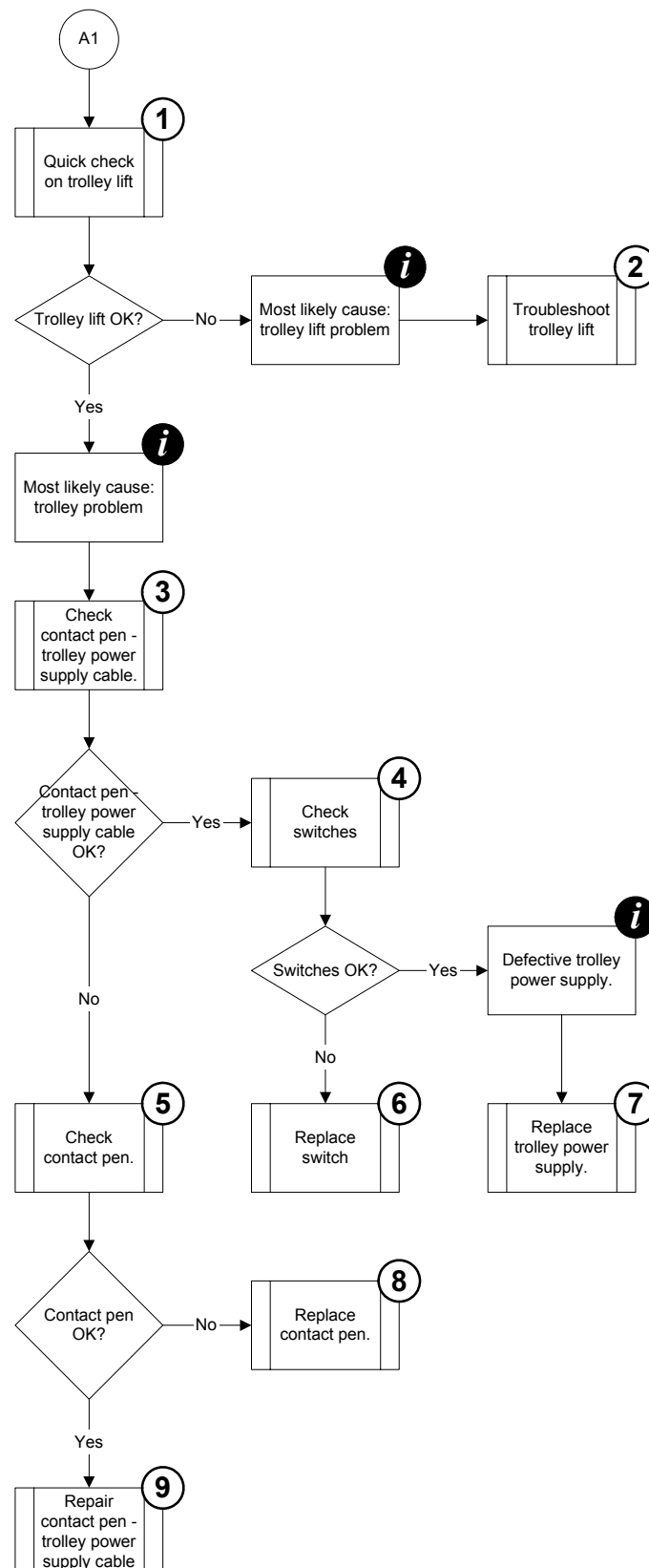
B5.2.4 Trolley lift, lifting and lowering diagnosis tree



Reference:

1. B5.2.4.1 Trolley, lowering electrically ,
2. B5.2.4.2. Feeder trolley, lowering mechanically
2. B5.2.4.3. Quick check on electrical interface
3. H8.11 Trolley interface board, replacement
OR
B8.15.1.5 Base interface board on trolley lift, replacement
4. B5.2.4.4. Check on contamination of mechanical interface
5. B5.2.4.5. Check base-trolley compatibility

Figure 26 A-series trolley, lifting and lowering diagnosis tree



Reference:

- 1.B5.2.4.5. Quick check on trolley lift.
- 2.B5.2.3 Trolley lift, diagnosis tree
- 3.B5.2.4.6. Check contact pen - trolley power supply cable
- 4.B5.2.4.8. Check switches
- 5.B5.2.4.7. Check contact pen
- 6.H8.22 Foot switch of tray trolley, replacement
- 7.E8.3.2 Trolley power supply board, replacement
- 8.H8.10 Contact pins on tray trolley, replacement
- 9.E5.4.1 A-series feeder trolley, diagram .

Figure 27 A-series trolley, lifting and lowering diagnosis tree

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B5.2.4.1 Trolley, lowering electrically



DANGER OF CLAMPING FINGERS

Serious injury to fingers.
Keep hands away from moving parts.



NOTE: In case the trolley can not be removed using the foot switch, an extra service switch is provided.

1. Prerequisites

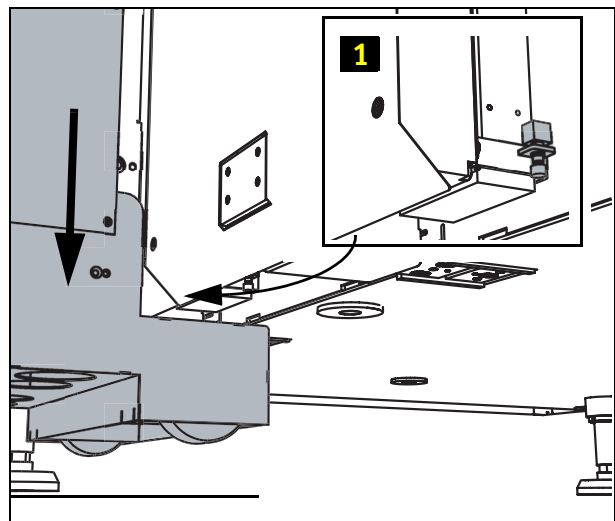
- Remove the neighboring trolley at the right side.

2. Lower the trolley

- Use the service switch (1) to lower the trolley.

WARNING: Do not put any body parts under the trolley.

- If this procedure does not lower the trolley, see [B5.2.4.2 Feeder trolley, lowering mechanically](#).



B5.2.4.2 Feeder trolley, lowering mechanically



DANGER OF CLAMPING FINGERS

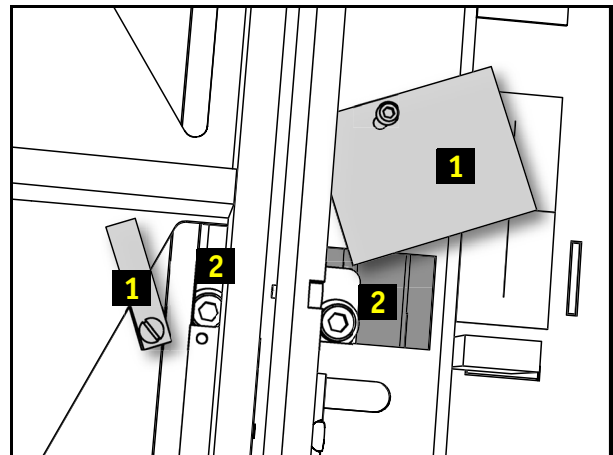
Serious injury to fingers.
Keep hands away from moving parts.

1. Prerequisites

- Remove all feeders from the trolley.
- Open the hood.
- Push XY robot away from concerning feeder section.
- Remove the bottom feeder guide.

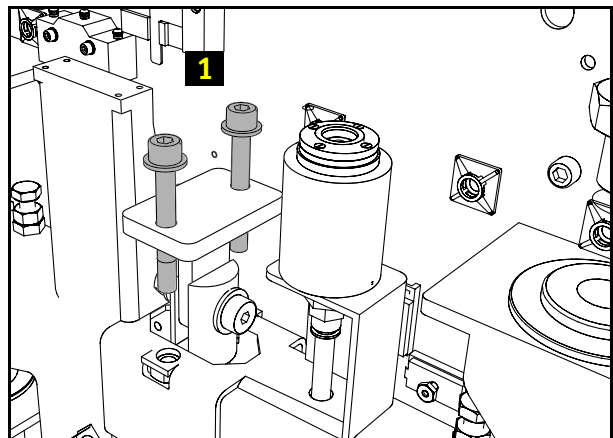
2. Lower the trolley

- Remove both cover plates (1) (2x 1 Allen bolt).
- Push an Allen key 6 mm x 350 mm through the 2 holes in the trolley lift cover plate.
- Loosen the 2 Allen bolts (2) that fix the trolley lift cross beam.
The trolley lowers down due to its own weight.
Do not put any body parts under the trolley.
- Remove the trolley from the trolley lift.



3. Mount the bolts on the cross beam

- Remove the trolley lift front plate (4 screws, 1 earth connection).
- Place the 2 Allen bolts (1) that fix the trolley lift cross beam back.
- Place the trolley lift front plate (4 screws, 1 earth connection) back.



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B5.2.4.3 Quick check on electrical interface

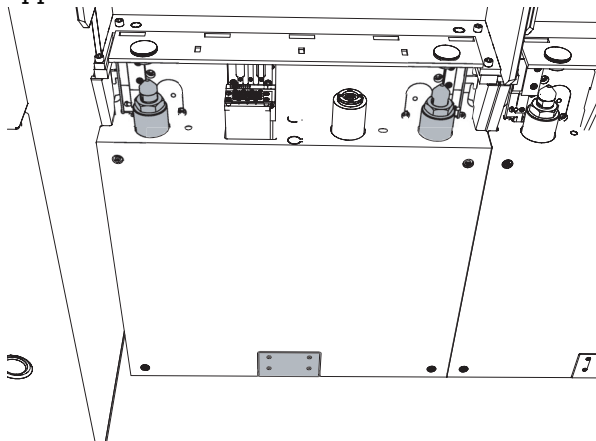
Inspect the electrical interface between the trolley and the trolley lift on damage or contamination (components causing short-circuit etc.):

- Trolley interface board
- Base interface board.

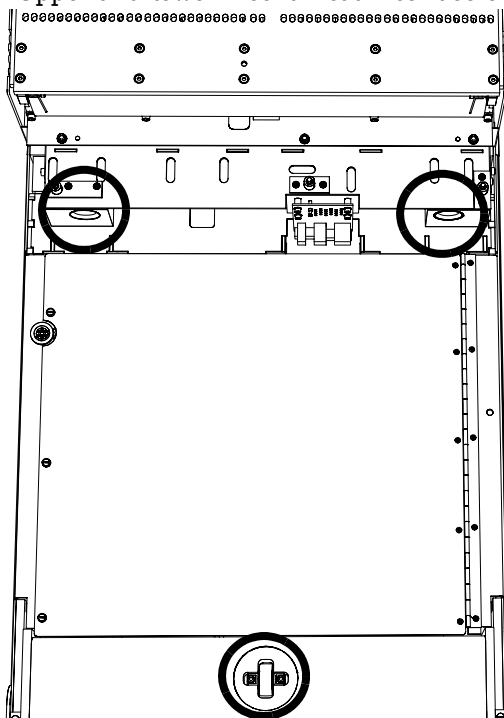
B5.2.4.4 Check on contamination of mechanical interface

Inspect the mechanical interface between the trolley and the trolley lift on contamination (components causing trolley misalignment etc.):

- Upper and lower mechanical interface on the trolley lift.



- Upper and lower mechanical interface on the trolley.



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B5.2.4.5 Quick check on trolley lift

Interconnect the 'common' and 'up' connections on the trolley lift.
If the trolley lift moves upward, the trolley lift is OK.

B5.2.4.6 Check contact pen - trolley power supply cable

1. Open the door to the trolley power supply.
2. Disconnect the X9 and X12 from the trolley power supply, see [E5.3.1.2](#).
Find the location of the 'up', 'down' and 'common' contact pen, see [E5.4.1](#).
 - a) Measure the resistance of the cable from X9 (both pins) to the 'common' contact pen.
Two measurements (both pins on X9) of 0 Ohm is OK.
 - b) Measure the resistance of the cable from X12 pen 1 to the 'down' contact pen.
0 Ohm is OK.
 - c) Measure the resistance of the cable from X12 pen 2 to the 'up' contact pen.
0 Ohm is OK.

B5.2.4.7 Check contact pen

1. Remove the contact pin (using pliers) from the contact pen housing.
Check that there is no corrosion on the contact pen or inside the contact pen housing.
2. Open the door to the trolley power supply.
3. Disconnect the X9 and X12 from the trolley power supply, see [E5.3.1.2](#).
Find the location of the 'up', 'down' and 'common' contact pen housing, see [E5.4.1](#).
 - a) Measure the resistance of the cable from X9 (both pins) to the 'common' contact pen housing.
Two measurements (both pins on X9) of 0 Ohm is OK.
 - b) Measure the resistance of the cable from X12 pin 1 to the 'down' contact pen housing.
0 Ohm is OK.
 - c) Measure the resistance of the cable from X12 pin 2 to the 'up' contact pen housing.
0 Ohm is OK.

B5.2.4.8 Check switches

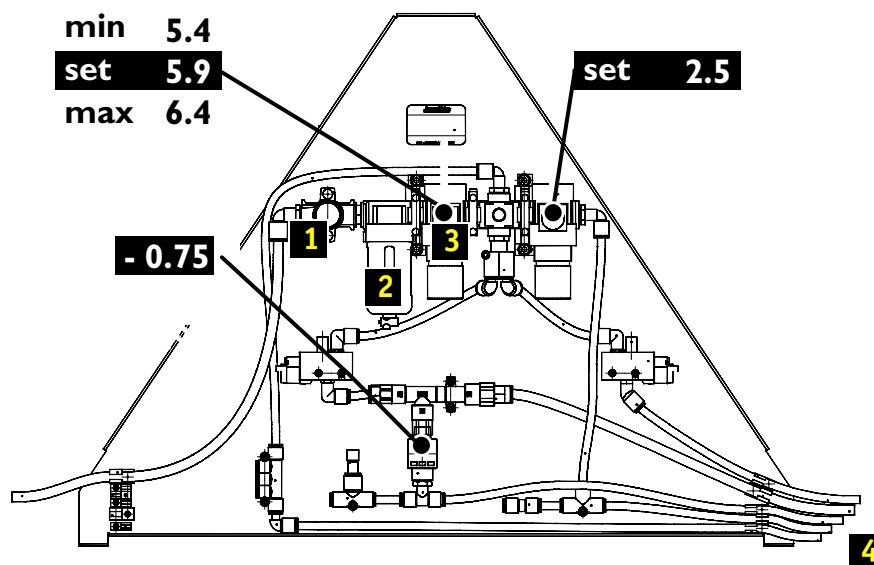
1. Open the door to the trolley power supply.
2. Disconnect X8 and X11 from the trolley power supply, see [E5.3.1.2](#)
3. Measure the resistance:
 - d) While the 'up' foot switch is pressed, measure the resistance of the cable from X8 pin 3 to pin 4.
0 Ohm is OK.
 - e) While the 'down' foot switch is pressed, measure the resistance of the cable from X11 pin 1 to pin 2.
0 Ohm is OK.

B5.2.5 Air supply unit, diagnosis table



HIGH AIR PRESSURE

Uncontrolled release of air pressure may cause injury.
Turn off and lock out system before servicing, see Safety chapter .



Symptom	Possible cause	Remedy
Problem related to pneumatics on the base	Status of the air supply unit not OK.	1. Check that the air pressure is available from the factory supply. 2. Check that the main air switch (1) is open. 3. Check that the air filter (2) is clean. 4. Check that the display on the digital pressure switch (3) reads 5.9 bar. Adjust if necessary (refer to operating manual). 5. Check on the connections (4) to and from the air supply unit.

Figure 28

B5.2.6 Touch screen, diagnosis table

■ This table can be used for trouble shooting **any** touch screen:

Error symptom	Possible cause	Remedy
Touch screen shows no image	Older types of monitor need 15 seconds to reset the touch screen.	Wait 15 seconds between powering down and powering up the machine.
		Disconnect the mains supply connector from the power supply of the touch screen (behind the front-right door of the base) and wait 15 seconds before reconnecting.
Fading screen after turning the touch screen.	Power supply interrupted caused by an incorrect cable length between touch screen and support.	Adapt the cable length.
Unexpected behaviour of the touch screen.	Dirt	• Clean the touch screen, see B7.1 Touch screen and keyboard, cleaning .
	Invalid calibration of touch screen.	Calibrate the touch screen, see B6.2 Touch screen, calibrating .
No touch function on a monitor.	Poor connection of RS 232 cable.	Check connection of RS232 cable to monitor

Figure 29 Touch screen, diagnosis table

B5.3 Reference information

B5.3.1 Control supply, lay-out

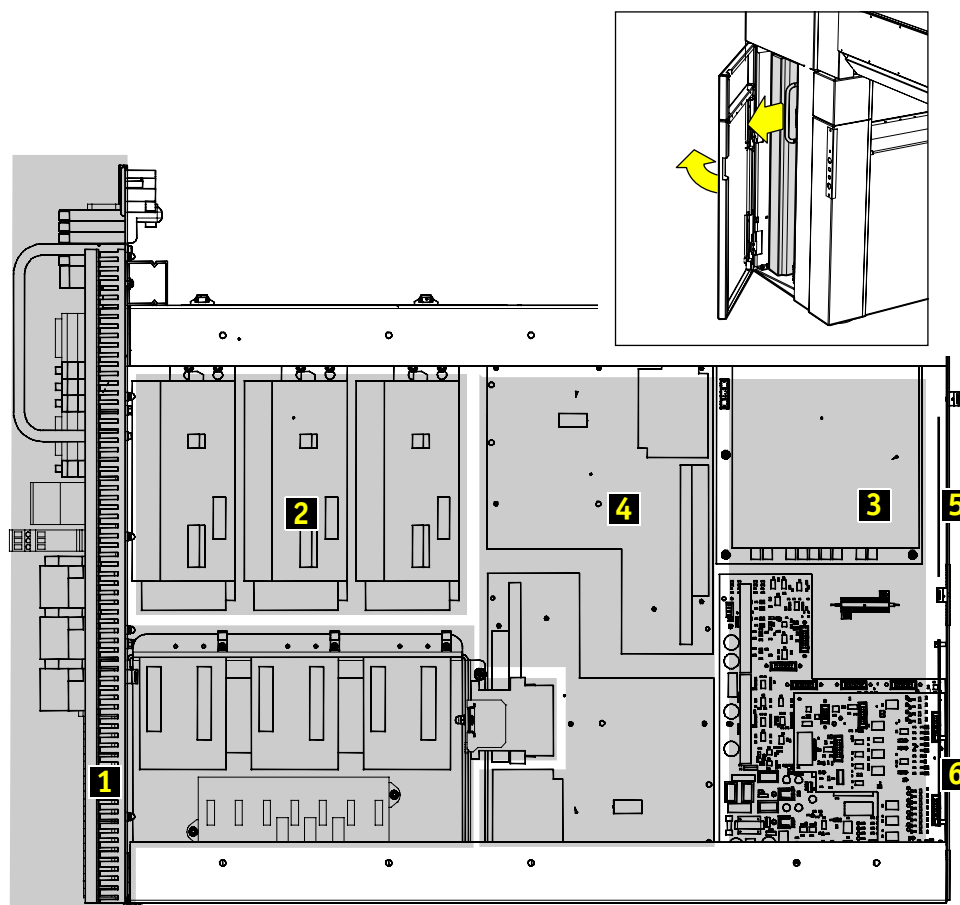


Figure 30 Control supply, lay-out

Item	Part of module	Reference
1	Base	B5.3.9 Mains supply PA 2410/00, features B5.3.9 Mains supply PA 2410/01, features
2	XY robot	G5.3.4 Motion amplifier, connections
3	Board transport	C5.3.1 Transport controller, LED status check
4	Pick and place	D5.3.4 Placement head HA controller, features
5	XY robot	G5.3.2 Interconnection board drives (IBD), connections
6	Base	B5.3.14 Interconnection board electrics, fuses and LED signalling

Figure 31 Control supply, lay-out

B5.3.2 Controllers, connections

B5.3.2.1 Controllers in PA 2410/01, connections

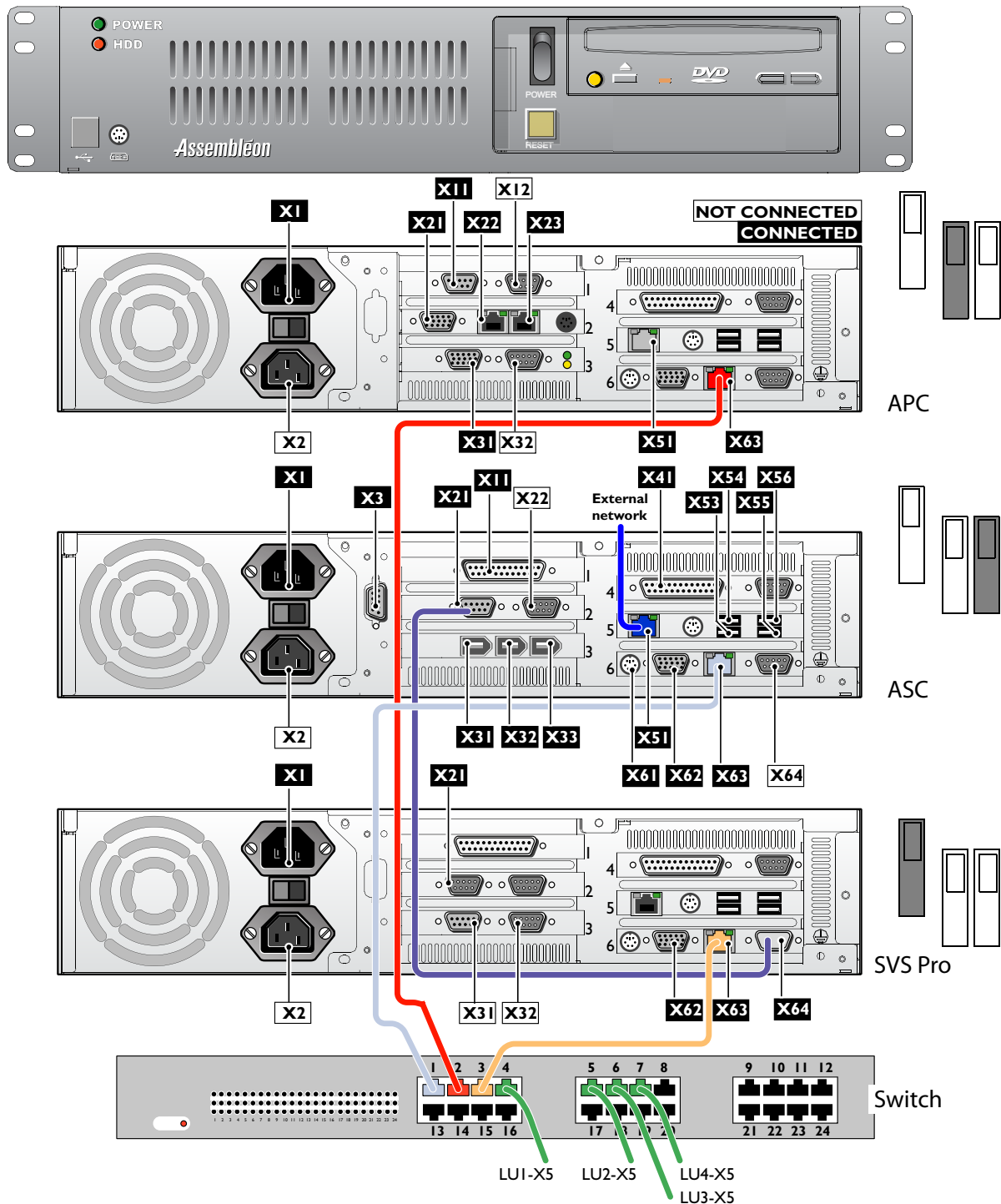


Figure 32 Controllers in PA 2410/01, connections overview

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Controller	Tag	Remarks
APC	APC.X1	Power supply
	APC.X11	CAN connection to interface board base
	APC.X21	Emergency stop XY robot
	APC.X22	Synqnet OUT
	APC.X23	Synqnet IN
	APC.X31	Bitbus
	APC.X63	Internal network connection to switch 2
ASC	ASC.X1	Power supply
	ASC.X3	Power supply 24V BA camera
	ASC.X11	LPT2, Software key
	ASC.X21	COM3 SVS (optional)
	ASC.X31	CA camera front
	ASC.X32	BA camera front/rear
	ASC.X33	CA camera rear
	ASC.X41	LPT1, trigger BA camera
	ASC.X42	COM2 1 st BTCO
	ASC.X51	External network connection to front side
	ASC.X53	Memory stick
	ASC.X54	USB port cable to front side
	ASC.X55	Touch screen front
	ASC.X56	Touch screen rear
	ASC.X61	Keyboard
	ASC.X62	VGA to monitor splitter
	ASC.X63	Internal network connection to switch 1
	ASC.X64	Touch screen front
SVS Pro (optional)	SVSPRO.X1	Power supply
	SVSPRO.X21	COM3 Scanner
	SVSPRO.X62	VGA to ext. monitor
	SVSPRO.X63	Internal network connection to switch 3
	SVSPRO.X64	COM1 Internal connection to ASC.X21

Figure 33 Controllers in PA 2410/01, connections overview

B5.3.2.2 Controllers in PA 2410/00, connections

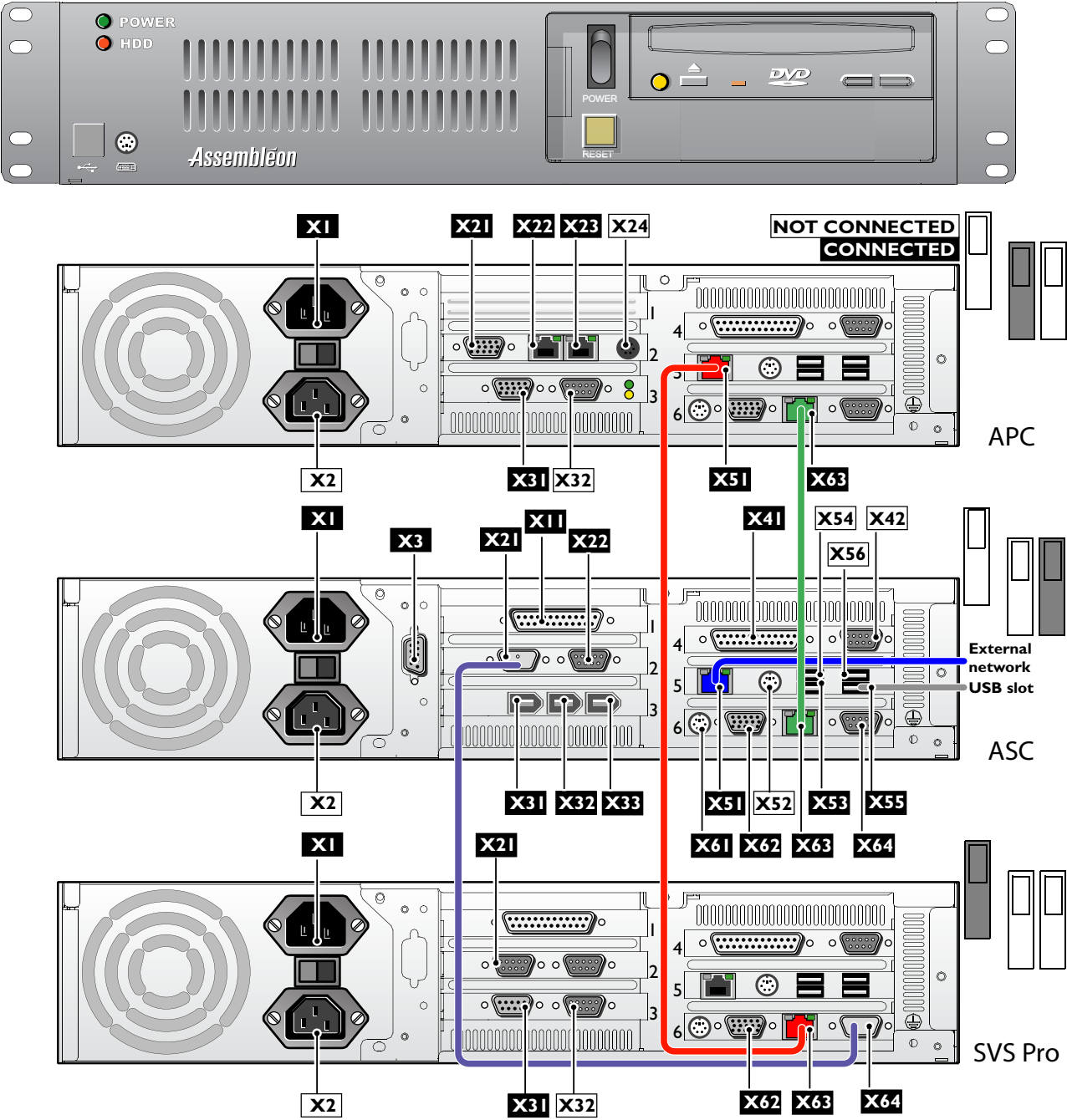


Figure 34 Controllers in PA 2410/00, connections overview

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Controller	Tag	Remarks
APC	APC.X1	Power supply
	APC.X21	Emergency stop XY robot
	APC.X22	Synqnet OUT
	APC.X23	Synqnet IN
	APC.X31	Bitbus
	APC.X63	Internal network connection to ASC.X63
ASC	ASC.X1	Power supply
	ASC.X3	Power supply 24V BA camera
	ASC.X11	LPT2, Software key
	ASC.X21	COM3 SVS (optional)
	ASC.X22	Touch screen rear
	ASC.X31	CA camera front
	ASC.X32	BA camera front/rear
	ASC.X33	CA camera rear
	ASC.X41	LPT1, trigger BA camera
	ASC.X42	COM2 1 st BTCO
	ASC.X51	External network connection to front side
	ASC.X53	Memory stick
	ASC.X55	USB port cable to front side
	ASC.X61	Keyboard
	ASC.X62	VGA to monitor splitter
	ASC.X63	Internal network connection to APC.X63
	ASC.X64	Touch screen front
SVS Pro (optional)	SVSPRO.X1	Power supply
	SVSPRO.X21	COM3 Scanner
	SVSPRO.X31	CAN SVS Pro - IBB
	SVSPRO.X62	VGA to ext. monitor
	SVSPRO.X63	Internal network connection to APC.X51
	SVSPRO.X64	COM1 Internal connection to ASC.X21

Figure 35 Controllers in PA 2410/00, connections overview

B5.3.3 Controllers, BIOS settings

	System controller (ASC)	Process controller (APC)	SVS Pro controller
IDE HDD AUTO DETECTION			
	Let Bios search for type of harddisk, accept standard choices.		
STANDARD CMOS FEATURES			
Time	<Set Time>		
Date	<Set Date>		
IDE Primary Master	<filled by 'ide hdd auto detection'>		
IDE Primary Slave	<filled by 'ide hdd auto detection'>		
IDE Secondary Master	None		
IDE Secondary Slave	None		
Drive A:	None		
Drive B	None		
Video	EGA/VGA		
Halt on	All, but keyboard		
ADVANCED BIOS FEATURES			
CPU feature	Press Enter	Press Enter	-
X Thermal Management	Thermal Monitor 1	Thermal Monitor 1	-
Virus Warning	Disabled		
CPU L1 & L2 Cache	Enabled		
Quick Power on Self Test.	Enabled		
First Boot Device	USB-FDD	CDROM	FLOPPY
Second Boot Device	CDROM	LAN1	CDROM
Third Boot Device	HDD-0		
Boot Other Device	Enabled		
Swap Floppy drive	Disabled		
Boot up floppy seek	Disabled		
Boot up Numlock Status	On		
Gate A20 option	Fast		
Typematic rate setting	Disabled		
X Typematic rate (chars/sec)	6		
X Typematic delay (msec)	250		
Security option	Setup		
APIC Mode	Enabled		
NPS Version Control For OS	1.4		
ADVANCED CHIPSET FEATURES			
DRAM Timing Selectable	By SPD		
X CAS Latency Time	2	2	2.5
X Active to Precharge Delay	6		
X DRAM RAS# to CAS# Delay	3		
X DRAM RAS# Precharge	3		
Memory Frequency For	Auto		
System Bios Cacheable	Enabled		
Video Bios Cacheable	Disabled		
Memory hole at 15M-16M	Disabled		
Delayed Transaction	Enabled		
Delay Prior to Thermal	16 Min		
Continous LAN Retry	Enabled	Enabled	-
AGP Graphics Aperture size	64		
Display Cache frequency	133MHz	133MHz	-
FWH write protection	Disabled	Disabled	-
On chip Video window size	64MB	64MB	-
** On-chip VGA settings **			

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	System controller (ASC)	Process controller (APC)	SVS Pro controller
On-Chip VGA		Enabled	
On-Chip Frame Buffer Size		8MB	
Boot Display		Auto	
INTEGRATED PERIPHERALS			
On-Chip Primary PCI IDE		Enabled	
IDE Primary Master PIO		Auto	
IDE Primary Slave PIO		Auto	
IDE Primary Master UDMA		Auto	
IDE Primary Slave UDMA		Auto	
On-Chip Secondary PCI IDE		Enabled	
IDE Secondary Master PIO		Auto	
IDE Secondary Slave PIO		Auto	
IDE Secondary Master UDMA		Auto	
IDE Secondary Slave UDMA		Auto	
USB controller	Enabled	Disabled	Enabled
USB 2.0 Controller	Enabled	Disabled	Enabled
USB Keyboard Support		Disabled	
USB Mouse Support		Disabled	
AC97 Audio		Auto	
Onboard LAN1 Device		Enabled	
Onboard LAN2 Device		Enabled	
Init Display First		PCI Slot	
IDE HDD Block Mode		Enabled	
Onboard FDC Controller		Enabled	
Onboard Serial Port 1		3F8/IRQ 4	
Onboard Serial Port 2		2F8/IRQ 3	
UART mode select		Normal	
X Rx/D , Tx/D Active		Hi,Lo	
X IR Transmission Delay		Enabled	
X UR2 Duplex Mode		Half	
X Use IR Pins		IR-Rx2Tx2	
Onboard Parallel Port		378/IRQ 7	
Parallel Port Mode		SPP	
X EPP Mode Select		EPP1.7	
X ECP Mode Use DMA		3	
POWER MANAGEMENT SETUP			
Power-Supply Type		ATX	
ACPI function		Enabled	
Power management		User define	
Video Off Method		DPMS	
Video Off in suspend		Yes	
Suspend type		Stop Grant	
MODEM Use IRQ		NA	
Suspend mode		Disabled	
HDD Power down		Disabled	
Soft-Off by PWR-BTTN		Instant off	
CPU THRM-Throttling		50%	
PowerOn by LAN		Enabled	
PowerOn by Modem		Enabled	
PowerOn by Alarm		Disabled	
X Date(of Month) Alarm		0	
X Time(hh:mm:ss) Alarm		0 :0 : 0	
** Reload Global Timer Events **			

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	System controller (ASC)	Process controller (APC)	SVS Pro controller
Primary IDE 0	Disabled		
Primary IDE 1	Disabled		
Secondary IDE 0	Disabled		
Secondary IDE 1	Disabled		
FDD / COM / LPT port	Disabled		
PCI PIRQ (A-D)#	Disabled		
PWRON After PWR-Fail	On		
PNP/PCI CONFIGURATION			
PNP OS Installed	Yes	Yes	No
Reset Configuration Data	Disabled		
Resources controlled by	Manual		
IRQ-3	Legacy ISA		
IRQ-4	Legacy ISA		
IRQ-5	PCI/ISA PnP		
IRQ-7	Legacy ISA		
IRQ-9	PCI/ISA PnP		
IRQ-10	PCI/ISA PnP		
IRQ-11	PCI/ISA PnP		
IRQ-12	Legacy ISA	PCI/ISA PnP	Legacy ISA
IRQ-14	PCI/ISA PnP	Legacy ISA	PCI/ISA PnP
IRQ-15	PCI/ISA PnP		
DMA-0	PCI/ISA PnP		
DMA-1	PCI/ISA PnP		
DMA-3	PCI/ISA PnP		
DMA-5	PCI/ISA PnP		
DMA-6	PCI/ISA PnP		
DMA-7	PCI/ISA PnP		
PCI/VGA palette snoop	Disabled		
PC HEALTH STATUS			
CPU warning temperature	Disabled	Disabled	70°C/158°F
ACPI Shutdown Temperature	Disabled		
FREQUENCY / VOLTAGE CONTROL			
Auto Detect PCI Clk	Disabled	Enabled	-
CPU clock / spread spectrum	Disabled		

Figure 36 BIOS settings

B5.3.4 Controllers, features

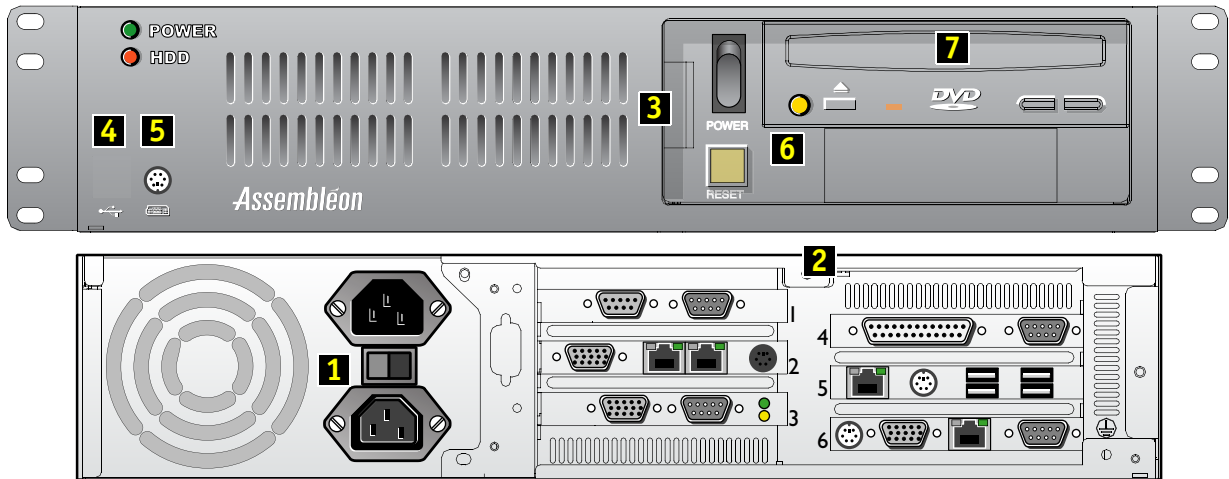


Figure 37 Controllers, features

No.	Item	Remarks
1	Power supply	300W ATX
2	Slots	System controller, see B5.3.5. System controller, slots Process controller, see B5.3.6. Process controller, slots SVS Pro controller, see B5.3.7. SVS Pro controller, slots
3	Air filter	B7.5 Filter in controllers, replacement
4	Cover	
5	Keyboard connection, front	PS/2
6	Hard disk	IDE 40GB
7	DVD-ROM drive	24 speed

Figure 38 Controller, features

B5.3.5 System controller, slots

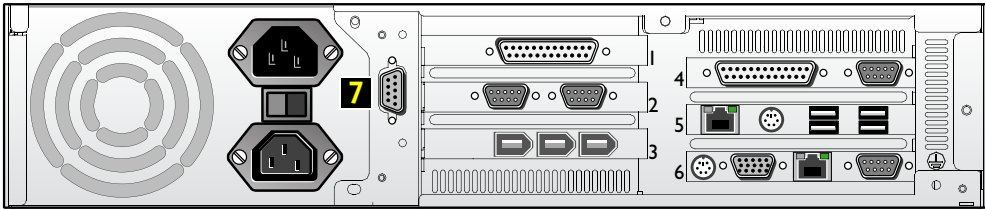


Figure 39 System controller, connections

Slot	Card	Remarks
1	RS232/LPT card	B5.3.5.2. RS232/LPT card LPT2
2		COM3, COM4
3	Firewire card	B5.3.5.1. Firewire card, settings with additional power supply (7)
4	Mother board	COM1,LPT1
5		Network, USB
6		Single board computer

Figure 40 System controller, connections

B5.3.5.1 Firewire card, settings

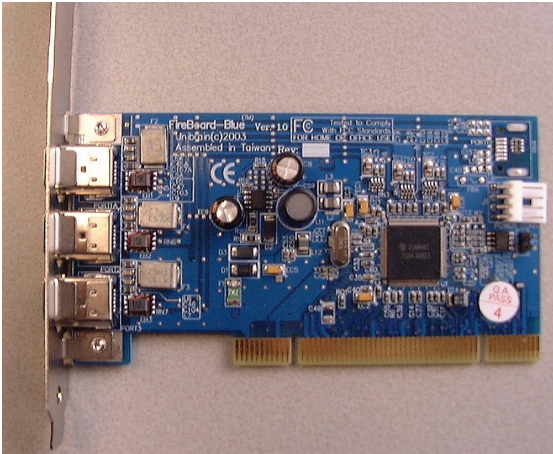


Figure 41 Firewire card, settings

No settings apply.

B5.3.5.2 RS232/LPT card

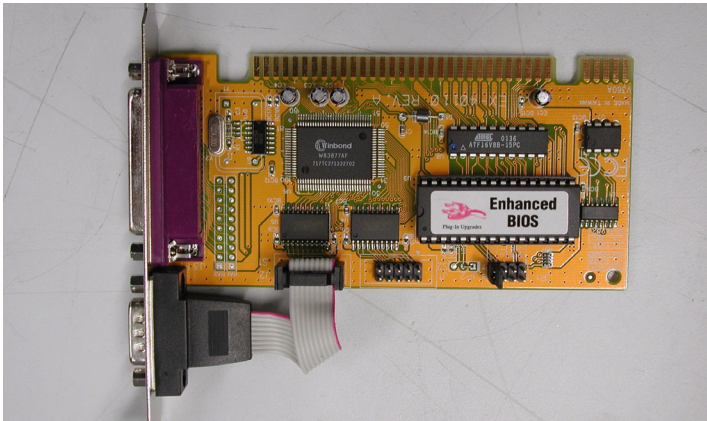


Figure 42

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B5.3.6 Process controller, slots

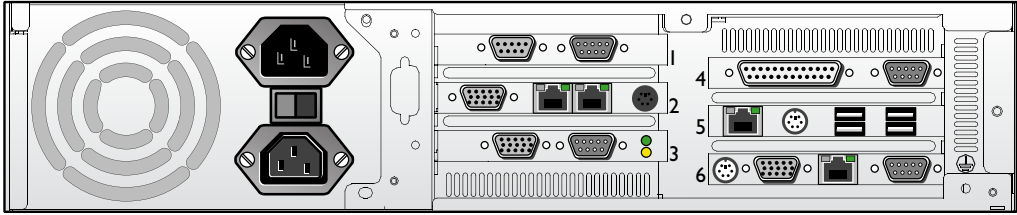


Figure 43 Process controller, slots

Slot	Card	Connection	Remarks
1	CAN	B5.3.6.1. CAN interface board, settings	PA 2410/01 only
2	XY controller	G5.3.1 XY controller, settings	
3	Bitbus	B5.3.6.2. Bitbus card, settings	
4	Mother board	COM1,LPT1	
5		Network, USB	
6		Single board computer	

Figure 44 Process controller, slots

B5.3.6.1 CAN interface board, settings



Figure 45 CAN interface board

B5.3.6.2 Bitbus card, settings

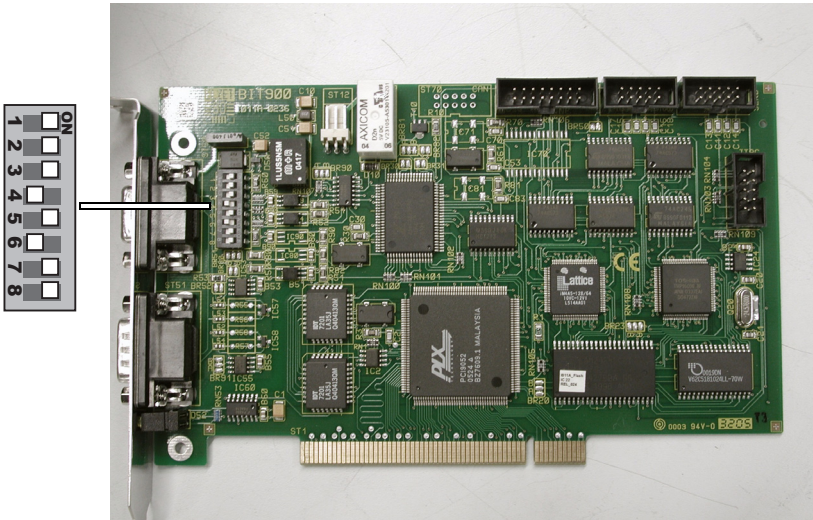


Figure 46 Bitbus card

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B5.3.7 SVS Pro controller, slots

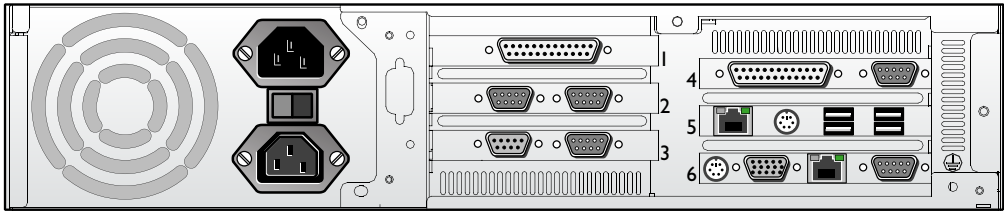


Figure 47 SVS Pro controller, slots

Slot	Card	Remarks
1	Multi I/O board	B5.3.7.1. Multi I/O card
2		
3	CAN Interface Board	B5.3.7.2. CAN interface board
4	Mother board	COM1,LPT1
5		Network, USB
6		Single board computer

Figure 48 SVS Pro controller, slots

B5.3.7.1 Multi I/O card

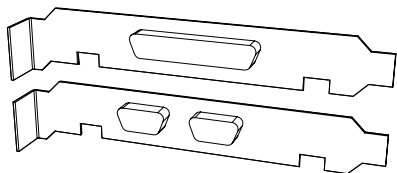


Figure 49 Multi I/O card

B5.3.7.2 CAN interface board

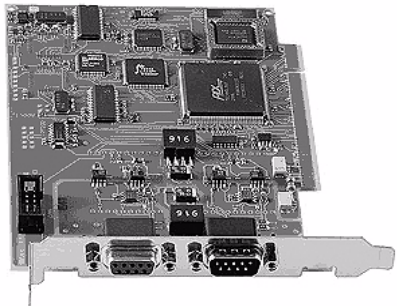


Figure 50 CAN interface board

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B5.3.8 Mains supply PA 2410/01, features

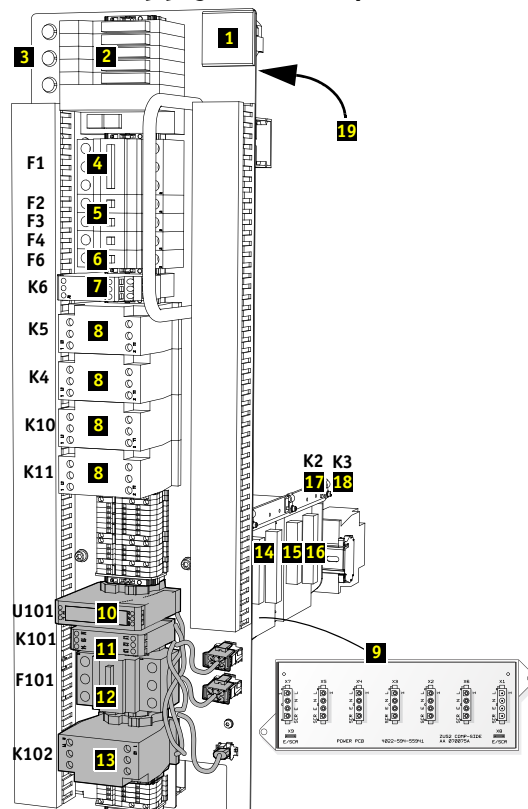


Figure 51 Mains supply PA 2410/01, features

Item	Label	Description	Remarks	Reference
1	-	Hours counter		-
2	-	Digital I/O		B5.3.9.4
3	-	Phase presence LEDs		
4	F1	Circ. breaker 16A/ 3P		-
5	F2	Circ. breaker 1P/8A	Power board 1, see B5.3.9.3	
	F3	Circ. breaker 1P/8A	Power board 2, see B5.3.9.3	
	F4	Circ. breaker 1P/8A	Power board 3, see B5.3.9.3	
6	F6	Circ. breaker 1P/4A		
7	K6	Safety relay	24V	B5.3.9.2
8	K5	Electric magnetic switch		
	K4	Electric magnetic switch		
	K10	Electric magnetic switch		
	K11	Electric magnetic switch		
9	-	Power board 3		B5.3.9.3
Machine with A-series transformer only				
10	U101	Power supply for K102		B5.3.8.2
11	K101	Phase guard relay		B5.3.8.1
12	F101	Circuit breaker, 3x4A	Protects the phase guard relay (K101) and the 24 V power supply (U101)	
13	K102	Power on relay		
14	-	Power supply unit 230V-24V DC/20A	22 Volts	-
15	-	Power supply unit 230V-24V DC/20A	22 Volts	-
16	-	Power supply unit 230V-24V DC/20A	24 Volts	-
17	K3	Electric magnetic switch	Motion amplifier XY robot	-
18	K2	Electric magnetic switch	Motion amplifier XY robot	-
19	-	ESD connection point		

Figure 52 Mains supply PA 2410/01, features

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B5.3.8.1 Phase guard relay (K101), features

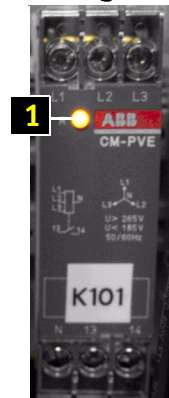


Figure 53 Phase guard relay in transformer

LED	Colour	LED illuminated meaning
1 R	Orange	3 phase voltage OK. (No phase sequence check)

Figure 54 Phase guard relay in transformer

B5.3.8.2 Power supply (U101, 24 V), features



Figure 55 Power supply (24 V) in transformer

LED	Colour	LED illuminated meaning
1 DC OK	Green	DC output OK

Figure 56 Power supply (24 V) in transformer

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B5.3.9 Mains supply PA 2410/00, features

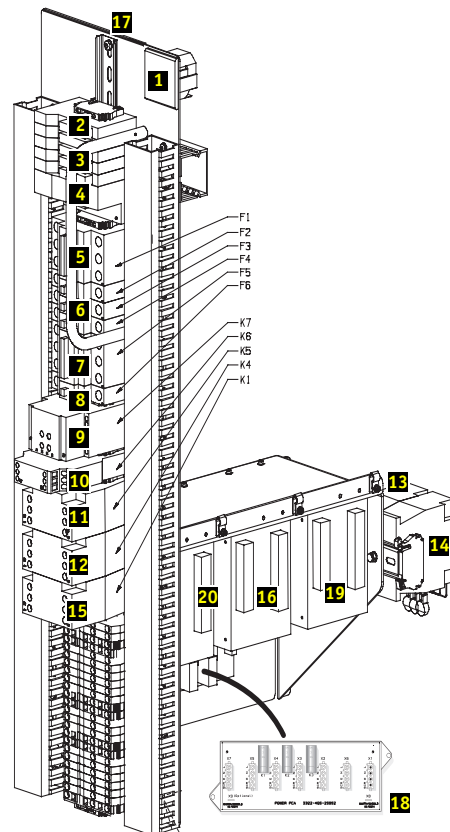


Figure 57

Item	Label	Description	Remarks	Reference
1	-	Hours counter		-
2,3,4	-	Digital I/O		B5.3.9.4
5	F1	Circ. breaker 3P/16A		-
6	F2	Circ. breaker 1P/8A	Power board 1	B5.3.9.3
	F3	Circ. breaker 1P/8A	Power board 2	B5.3.9.3
	F4	Circ. breaker 1P/8A	Power board 3	B5.3.9.3
7	F5	Circ. breaker 3P/2A	Phase guard relay	-
8	F6	Circ. breaker 1P/2A	Safety relay	-
9	K7	Phase guard relays		B5.3.9.1
10	K6	Safety relay	230V	B5.3.9.2
11	K5	Electric magnetic switch	44 Volts heads etc.	-
12	K4	Electric magnetic switch	44 Volts heads etc.	-
13	K3	Electric magnetic switch	Motion amplifier XY robot	-
14	K2	Electric magnetic switch	Motion amplifier XY robot	-
15	K1	Electric magnetic switch	Main power	-
16	-	Power supply unit 230V-24V DC/20A	22 Volts	-
17	-	ESD connection point		-
18	-	Power board 3		B5.3.9.3
19	-	Power supply unit 230V-24V DC/20A	24 Volts	-
20	-	Power supply unit 230V-24V DC/20A	22 Volts	-

Figure 58 Mains supply, features

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B5.3.9.1 Phase guard relay (K7), features



Figure 59 Phase guard relay

Only applicable for PA 2410/00

LED	Colour	Meaning
1	Yellow	Output relay on
2	Yellow	Output relay on
3	Red	Alarm on: not all 3 phases are present and / or phase sequence is incorrect
4	Green	Power supply on

Figure 60 Phase guard relay, LED signalling

Setting	Value	Meaning
5	20%	Asymmetry
6	20%	Tolerance
7	3 s	Delay 1
8	3 s	Delay 2
9	-	Dip switch settings according picture

Figure 61 Phase guard relay, settings

B5.3.9.2 Safety relay (K6), features

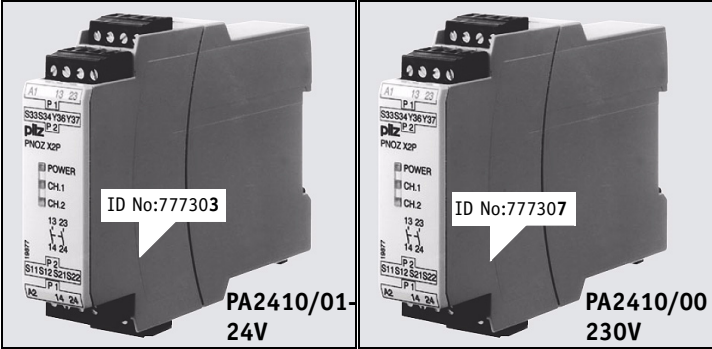


Figure 62 Safety relay

Don't mix up the safety relay (24V or 230V).

LED	Meaning
Power	Supply voltage is present on terminals (A1/A2)
CH.1	Safety sensing circuit 1 OK (incl. trolley lift etc.)
CH.2	Safety sensing circuit 2 OK

Figure 63 Safety relay, LED signalling

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B5.3.9.3 Power board, connections

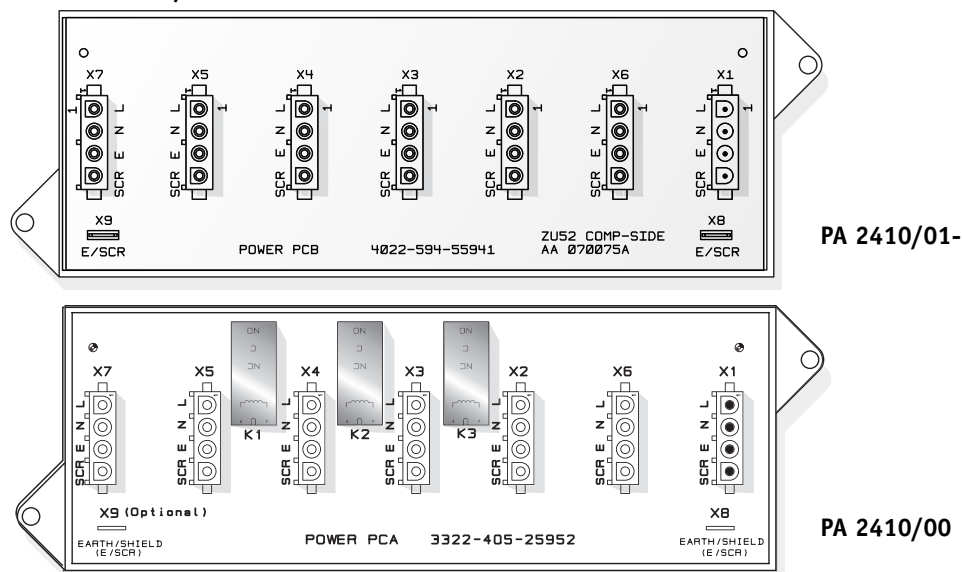


Figure 64 Power board

Power board	Item	
1 On top of process and system controller	X1	230V Power supply from mains supply unit (F2)
	X2	Spare
	X3	SVS scanner / controller
	X4	Monitor rear
	X5	monitor front
	X6	Process controller (APC)
	X7	System controller (ASC)
2 On top of process and system controller	X1	230V Power supply from mains supply unit (F3)
	X2	Trolley lift 1
	X3	Trolley lift 2
	X4	Trolley lift 3
	X5	Trolley lift 4
	X6	Splitter touch screen VGA second user interface
	X7	Switch internal network, PA 2410/01
3 In control supply unit	X1	230V Power supply from mains supply unit (F4)
	X2	Power supply 24V
	X3	Fans in hood, power board 4
	X4	Power supply 24V
	X5	Power supply 24V
	X6	-
	X7	Safety relay (K6)
4 In hood	X1	230V Power supply from power board 3, X3
	X2	Fan hood right rear
	X4	Fan hood left front
	X5	Fan hood left rear
	X6	Fan hood right front

Figure 65 Power board, connections

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B5.3.9.4 Digital I/O, LED signalling

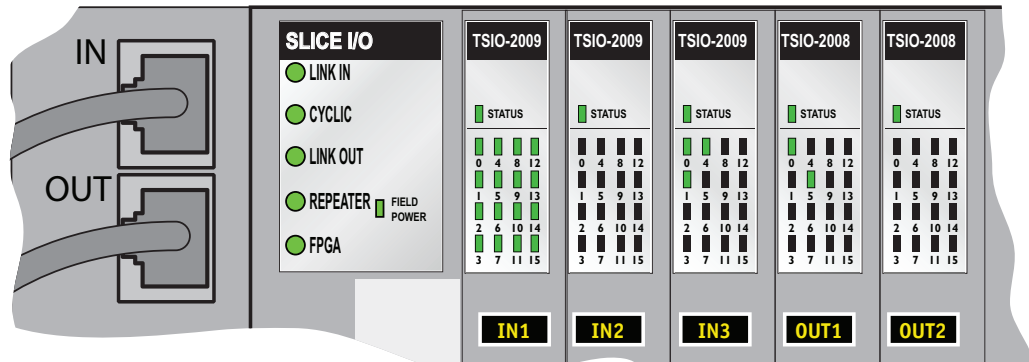


Figure 66 Digital I/O, LED signalling

Slice I/O	
LINK IN	Synqnet IN from Y2 amplifier
CYCLIC	-
LINK OUT	Synqnet OUT to Y2 placement DV controller
REPEATER	-
FPGA	Field programmable gate array
FIELD POWER	-

Inputs		Outputs	
IN1-0	Compressed Air Level OK	OUT1-0	Lamp White (Idle)
IN1-1	Vacuum Level OK	OUT1-1	Lamp Blue (Error)
IN1-2	Bitbus Nodes OK	OUT1-2	Lamp Green (Running)
IN1-3	Servo Power On	OUT1-3	Audio Beeper
IN1-4	Emergency Stop Front	OUT1-4	Trolley Exchange
IN1-5	Emergency Stop Rear	OUT1-5	Quick Stop Bitbus Nodes
IN1-6	Emergency Stop Cover Open Front Left	OUT1-6	Blower CA front/rear
IN1-7	Emergency Stop Cover Open Rear Left	OUT1-7	-
IN1-8	Feeder Ready Section 1	OUT1-8	Valve 1 (verification tool)
IN1-9	Feeder Ready Section 2	OUT1-9	Valve 2 (verification tool)
IN1-10	Feeder Ready Section 3	OUT1-10	Valve 3 (verification tool)
IN1-11	Feeder Ready Section 4	OUT1-11	Valve 4 (verification tool)
IN1-12	Emergency Stop Trolley Lift 1	OUT1-12	Claim fluxer
IN1-13	Emergency Stop Trolley Lift 2	OUT1-13	-
IN1-14	Emergency Stop Trolley Lift 3	OUT1-14	-
IN1-15	Emergency Stop Trolley Lift 4	OUT1-15	-
Inputs		Outputs	
IN2-0	Input aux. Feeding Front S1-C1-1	OUT2-0	Output aux. Feeding Front S1-C1-1
IN2-1	Input aux. Feeding Front S1-C1-2	OUT2-1	Output aux. Feeding Front S1-C1-2
IN2-2	Input aux. Feeding Front S1-C2-1	OUT2-2	Output aux. Feeding Front S1-C2-1
IN2-3	Input aux. Feeding Front S1-C2-2	OUT2-3	Output aux. Feeding Front S1-C2-2
IN2-4	Input aux. Feeding Front S2-C1-1	OUT2-4	Output aux. Feeding Front S2-C1-1
IN2-5	Input aux. Feeding Front S2-C1-2	OUT2-5	Output aux. Feeding Front S2-C1-2
IN2-6	Input aux. Feeding Front S2-C2-1	OUT2-6	Output aux. Feeding Front S2-C2-1
IN2-7	Input aux. Feeding Front S2-C2-2	OUT2-7	Output aux. Feeding Front S2-C2-2
IN2-8	Input aux. Feeding Rear S3-C1-1	OUT2-8	Output aux. Feeding Rear S3-C1-1
IN2-9	Input aux. Feeding Rear S3-C1-2	OUT2-9	Output aux. Feeding Rear S3-C1-2
IN2-10	Input aux. Feeding Rear S3-C2-1	OUT2-10	Output aux. Feeding Rear S3-C2-1
IN2-11	Input aux. Feeding Rear S3-C2-2	OUT2-11	Output aux. Feeding Rear S3-C2-2
IN2-12	Input aux. Feeding Rear S4-C1-1	OUT2-12	Output aux. Feeding Rear S4-C1-1
IN2-13	Input aux. Feeding Rear S4-C1-2	OUT2-13	Output aux. Feeding Rear S4-C1-2
IN2-14	Input aux. Feeding Rear S4-C2-1	OUT2-14	Output aux. Feeding Rear S4-C2-1
IN2-15	Input aux. Feeding Rear S4-C2-2	OUT2-15	Output aux. Feeding Rear S4-C2-2

Inputs		Outputs
IN3-0	E-stop Cover Open Front Right	
IN3-1	E-stop Cover Open Rear Right	
IN3-2	E-stop spare	
IN3-3	E-stop External	
IN3-4	No overvoltage (44V)	
IN3-5	E-stop spare +external	
IN3-6	Fluxer ready	
IN3-7	Fluxer cover placed	
IN3-8	-	
IN3-9	-	
IN3-10	-	
IN3-11	-	
IN3-12	-	
IN3-13	-	
IN3-14	-	
IN3-15	-	

B5.3.10 Air supply unit, features

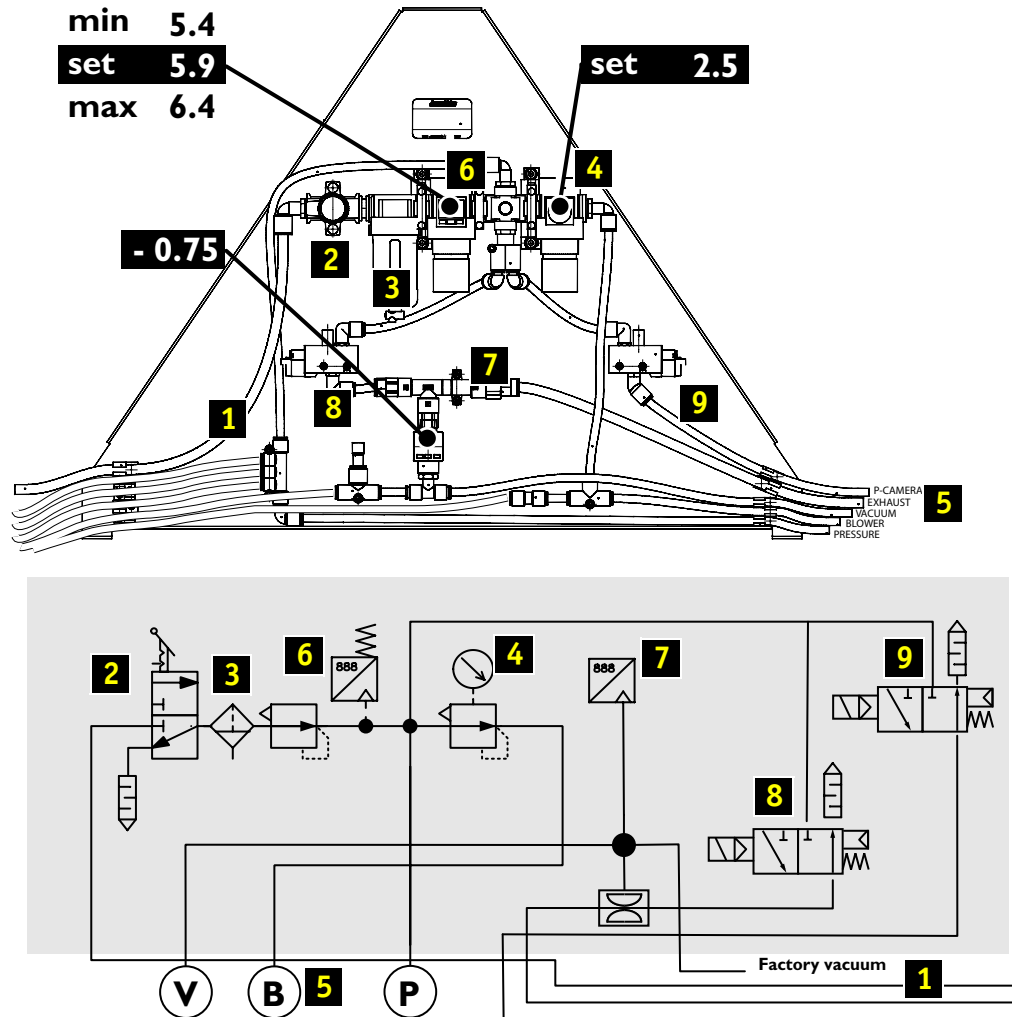


Figure 67 Air supply unit, components

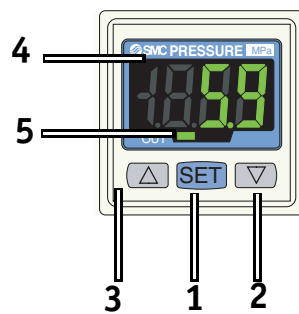
No.	Description	
1	Compressed air supply	
2	Main air valve (open, closed)	
3	Air filter, 0.3 μm	
4	Analog pressure gauge	B6.4.2.8 Blower pressure adjustment
5	Output	
6	Digital pressure switch	For error codes, see B5.3.10.1 Setting the digital pressure switch, see B6.4 Digital pressure switch, check and adjust settings
7	Digital vacuum switch	B6.4 Digital pressure switch, check and adjust settings
8	Vacuum valve	Vacuum supply placement heads HA
9	Pressure valve	Blow off CA camera

Figure 68 Air supply unit

Diagram, see [B5.4.5 Air and vacuum, diagram](#) .

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B5.3.10.1 Digital pressure switch, settings



No.		Function
1	SET	Button used to switch the mode, and to set the value.
2,3	UP,DOWN button	Use to change mode and set value
4	LCD Display	Display the measured pressure value, each set content or error code.
5	LED (green)	Displays the switch operation status

Figure 69 Digital pressure switch

Unit	Value	Display
'Initial set' mode		
Unit	Bar	bAr
Display colour		SoG
Operating mode		Ynd
Output type set	Normal open	no
Response time	640 msec	640
'Pressure set' mode		
Pressure set	Min. 5.4 Bar	P_1 / 5.40
	Max. 6.4 Bar	P_2 / 6.40

Figure 70 Settings digital pressure switch

Error code	Error name	Problem	Solution
Er1	Current overload error	Current switch output >80mA	Switch off main power, recover fault and switch on main power.
Er3	Residual pressure error.	Pressure detecting during zero reset. After 3 sec. system returns automatically to measuring mode.	Change applied pressure into atmospheric pressure. Repeat zero reset.
HHH LLL	Applied pressure error	Applied pressure exceeds min. or max. limit of pressure range.	Reduce or increase supply pressure to within the regulating pressure range.
Er4 Er6 Er7 Er8	System error	Internal system/data error.	Switch off main power, and switch on again. If problem persists, replace the digital pressure switch.

Figure 71 Errors on display digital pressure switch

B5.3.11 Interconnection board base, fuses and LED signalling

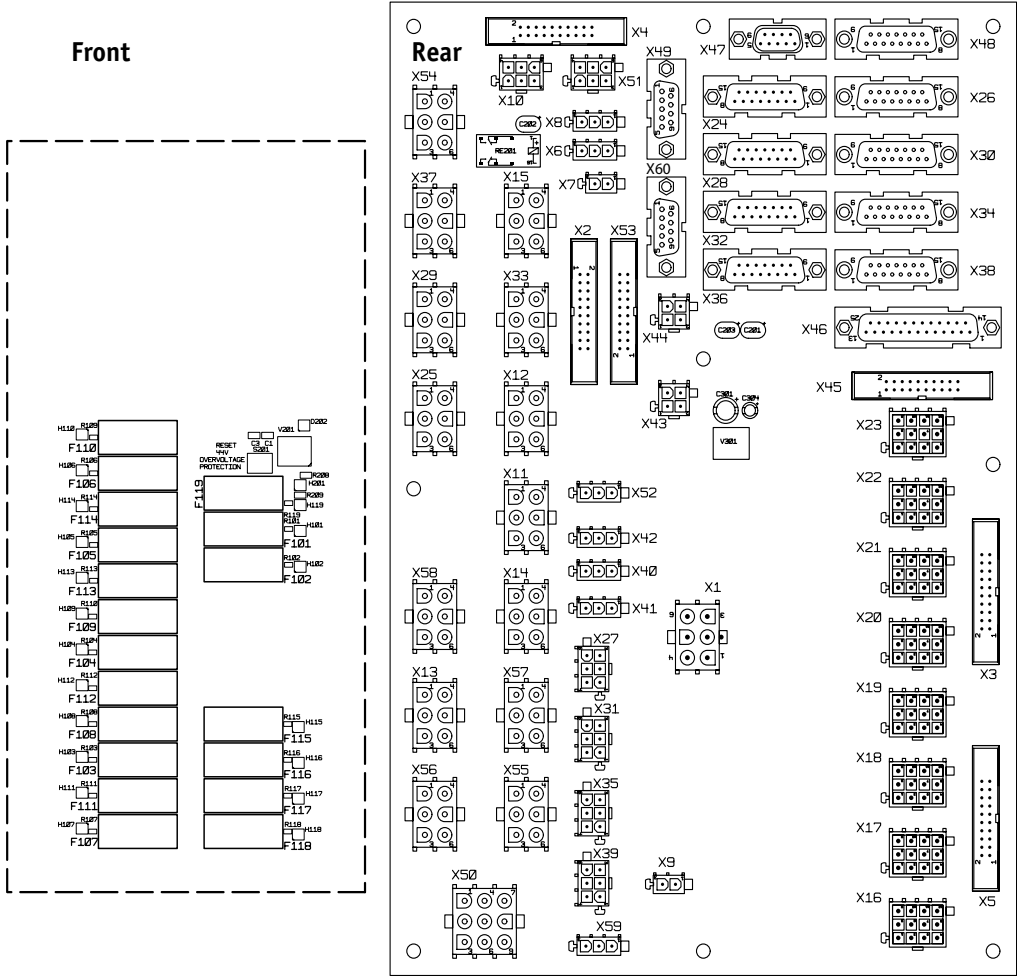


Figure 72 Interconnection board base, fuses and LED signalling

Fuse	Amp		LED	Colour
F101	4AT	24V - IO	H101	Green
F102	4AT	24V - camera	H102	Green
F103	2AT	24V - Aux. feeding S1	H103	Green
F104	2AT	24V - Aux. feeding S2	H104	Green
F105	2AT	24V - Aux. feeding S3	H105	Green
F106	2AT	24V - Aux. feeding S4	H106	Green
F107	2AT	45V - Aux. feeding S1	H107	Green
F108	2AT	45V - Aux. feeding S2	H108	Green
F109	2AT	45V - Aux. feeding S3	H109	Green
F110	2AT	45V - Aux. feeding S4	H110	Green
F111	2AT	45V - Emergency Stop - Aux. feeding S1	H111	Green
F112	2AT	45V - Emergency Stop - Aux. feeding S2	H112	Green
F113	2AT	45V - Emergency Stop - Aux. feeding S3	H113	Green
F114	2AT	45V - Emergency Stop - Aux. feeding S4	H114	Green
F115	2AT	45V - Trolley lift 1	H115	Green
F116	2AT	45V - Trolley lift 2	H116	Green
F117	2AT	45V - Trolley lift 3	H117	Green
F118	2AT	45V - Trolley lift 4	H118	Green
F119	4AT	24V - Fluxer	H119	Green
-	-	44V - Over voltage protection	H201	Red

Figure 73 Interconnection board base, fuses and LED signalling

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B5.3.12 Interconnection board base, connections

	Connection		Connection
X1	Supply in 24V/45V	X31	Trolleylift 2 45V-Emergency Stop
X2	16 Input Module 1	X32	Trolleylift 3 CAN
X3	16 Input Module 2	X33	Trolleylift 3 Emergency Stop
X4	16 Output Module 1	X34	Trolleylift 3 bitbus
X5	16 Output Module 2	X35	Trolleylift 3 45V-Emergency Stop
X6	Vacuum Sensor	X36	Trolleylift 4 CAN
X7	Valve (Vacuum)	X37	Trolleylift 4 Emergency Stop
X8	Pressed air sensor	X38	Trolleylift 4 bitbus
X9	Teller	X39	Trolleylift 4 45V-Emergency Stop
X10	Lamp post	X40	24V Supply CA Front
X11	Emergency Stop button front	X41	24V Supply CA Rear
X12	Emergency Stop button rear	X42	24V Supply BA1&2
X13	Emergency Stop cover front right	X43	Trigger Front
X14	Emergency Stop cover rear right	X44	Trigger Rear
X15	Spare External Safety	X45	Trigger BA1&2
X16	Aux feeding S1C1	X46	LPT1 controller
X17	Aux feeding S1C2	X47	CAN (from SVS controller or APC)
X18	Aux feeding S2C1	X48	Bitbus in from Interconnection Board 2
X19	Aux feeding S2C2	X49	Verification Tool
X20	Aux feeding S3C1	X50	to E-stop relay
X21	Aux feeding S3C2	X51	Blower CA front/rear
X22	Aux feeding S4C1	X52	24V supply Slice IO
X23	Aux feeding S4C2	X53	16 Input Module 3
X24	Trolleylift 1 CAN	X54	Emergency Stop spare
X25	Trolleylift 1 Emergency Stop	X55	Emergency Stop Enabling Switch Front
X26	Trolleylift 1 bitbus	X56	Emergency Stop Cover Front Left
X27	Trolleylift 1 45V-Emergency Stop	X57	Emergency Stop Cover Rear Left
X28	Trolleylift 2 CAN	X58	Emergency Stop Enabling Switch Rear
X29	Trolleylift 2 Emergency Stop	X59	Emergency Stop to XY controller
X30	Trolleylift 2 bitbus	X60	Fluxer

Figure 74

B5.3.13 Interconnection board base, signals

Pins	Description	Netname	Pins	Description	Netname
IBB.X1	Supply in				
1	24V	24V	4	EARTH	Earth
2	44V-ES	44V-ES	5	0V	0V
3	0V	0V	6	44V	44V
IBB.X2	16 Input Module 1				
1	IN1-0	IN1-0	11	IN1-10	IN1-10
2	IN1-1	IN1-1	12	IN1-11	IN1-11
3	IN1-2	IN1-2	13	IN1-12	IN1-12
4	IN1-3	IN1-3	14	IN1-13	IN1-13
5	IN1-4	IN1-4	15	IN1-14	IN1-14
6	IN1-5	IN1-5	16	IN1-15	IN1-15
7	IN1-6	IN1-6	17	0V	0V
8	IN1-7	IN1-7	18	0V	0V
9	IN1-8	IN1-8	19	24V	N.C.
10	IN1-9	IN1-9	20	24V	N.C.
IBB.X3	16 Input Module 2				
1	IN2-0	IN2-0	11	IN2-10	IN2-10
2	IN2-1	IN2-1	12	IN2-11	IN2-11
3	IN2-2	IN2-2	13	IN2-12	IN2-12

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Pins	Description	Netname	Pins	Description	Netname
4	IN2-3	IN2-3	14	IN2-13	IN2-13
5	IN2-4	IN2-4	15	IN2-14	IN2-14
6	IN2-5	IN2-5	16	IN2-15	IN2-15
7	IN2-6	IN2-6	17	0V	0V
8	IN2-7	IN2-7	18	0V	0V
9	IN2-8	IN2-8	19	24V	N.C.
10	IN2-9	IN2-9	20	24V	N.C.
IBB.X4	16 Output Module 1				
1	OUT1-1	OUT1-1	11	OUT1-11	OUT1-11
2	OUT1-2	OUT1-2	12	OUT1-12	OUT1-12
3	OUT1-3	OUT1-3	13	OUT1-13	OUT1-13
4	OUT1-4	OUT1-4	14	OUT1-14	OUT1-14
5	OUT1-5	OUT1-5	15	OUT1-15	OUT1-15
6	OUT1-6	OUT1-6	16	OUT1-16	OUT1-16
7	OUT1-7	OUT1-7	17	0V	0V
8	OUT1-8	OUT1-8	18	0V	0V
9	OUT1-9	OUT1-9	19	24V	N.C.
10	OUT1-10	OUT1-10	20	24V	N.C.
IBB.X5	16 Output Module 2				
1	OUT2-1	OUT2-1	11	OUT2-11	OUT2-11
2	OUT2-2	OUT2-2	12	OUT2-12	OUT2-12
3	OUT2-3	OUT2-3	13	OUT2-13	OUT2-13
4	OUT2-4	OUT2-4	14	OUT2-14	OUT2-14
5	OUT2-5	OUT2-5	15	OUT2-15	OUT2-15
6	OUT2-6	OUT2-6	16	OUT2-16	OUT2-16
7	OUT2-7	OUT2-7	17	0V	0V
8	OUT2-8	OUT2-8	18	0V	0V
9	OUT2-9	OUT2-9	19	24V	N.C.
10	OUT2-10	OUT2-10	20	24V	N.C.
IBB.X6	Vacuum Sensor				
1	24V	24V-I0	3	0V	0V
2	Output	IN1-1			
IBB.X7	Valve (Vacuum)				
1	24V	24V-I0	2	0V	0V
IBB.X8	Pressed air sensor				
1	24V	24V-I0	3	0V	0V
2	Output	IN1-0			
IBB.X9	Teller				
1	24V	IN1-3	2	0V	0V
IBB.X10	Lamppost				
1	Lamp white	OUT1-0	4	Beeper	OUT1-3
2	Lamp blue	OUT1-1	5	N.C.	N.C.
3	Lamp green	OUT1-2	6	0V	0V
IBB.X11	ES button front				
1	Switch3	24V-I0	4	Switch3	IN1-4
2	Switch1	ES1-5	5	Switch2	ES2-5
3	Switch1	ES1-6	6	Switch2	ES2-6
IBB.X12	ES button rear				
1	Switch3	24V-I0	4	Switch3	IN1-5
2	Switch1	ES1-6	5	Switch2	ES2-6
3	Switch1	ES1-7	6	Switch2	ES2-7
IBB.X13	ES Cover Front Right				
1	Switch3	24V-I0	4	Switch3	IN3-0
2	Switch1	ES1-2	5	Switch2	ES2-2
3	Switch1	ES1-3	6	Switch2	ES2-3
IBB.X14	ES Cover Rear Right				

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Pins	Description	Netname	Pins	Description	Netname
1	Switch3	24V-I0	4	Switch3	IN3-1
2	Switch1	ES1-4	5	Switch2	ES2-4
3	Switch1	ES1-5	6	Switch2	ES2-5
IBB.X15 ES External					
1	Detection	24V-I0	4	Detection	IN3-3
2	Input	ES1-12	5	Output	ES-SP1
3	Input	ES1-13	6	Output	ES-SP2
IBB.X16 Aux feeding S1C1					
1	24V	24V-AFS1	7	0V	0V
2	44V-ES	44V-ES-AFS1	8	0V	0V
3	0V	0V	9	Input aux. Feeding Front S1-C1-1	IN2-0
4	EARTH	Earth	10	Input aux. Feeding Front S1-S1-2	IN2-1
5	0V	0V	11	Output aux. Feeding Front S1-C1-1	OUT2-0
6	44V	44V-AFS1	12	Output aux. Feeding Front S1-C1-2	OUT2-1
IBB.X17 Aux feeding S1C2					
1	24V	24V-AFS1	7	0V	0V
2	44V-ES	44V-ES-AFS1	8	0V	0V
3	0V	0V	9	Input aux. Feeding Front S1-C2-1	IN2-2
4	EARTH	Earth	10	Input aux. Feeding Front S1-C2-2	IN2-3
5	0V	0V	11	Output aux. Feeding Front S1-C2-1	OUT2-2
6	44V	44V-AFS1	12	Output aux. Feeding Front S1-C2-2	OUT2-3
IBB.X18 Aux feeding S2C1					
1	24V	24V-AFS2	7	0V	0V
2	44V-ES	44V-ES-AFS2	8	0V	0V
3	0V	0V	9	Input aux. Feeding Front S2-C1-1	IN2-4
4	EARTH	Earth	10	Input aux. Feeding Front S2-C1-2	IN2-5
5	0V	0V	11	Output aux. Feeding Front S2-C1-1	OUT2-4
6	44V	44V-AFS2	12	Output aux. Feeding Front S2-C1-2	OUT2-5
IBB.X19 Aux feeding S2C2					
1	24V	24V-AFS2	7	0V	0V
2	44V-ES	44V-ES-AFS2	8	0V	0V
3	0V	0V	9	Input aux. Feeding Front S2-C2-1	IN2-6
4	EARTH	Earth	10	Input aux. Feeding Front S2-C2-2	IN2-7
5	0V	0V	11	Output aux. Feeding Front S2-C2-1	OUT2-6
6	44V	44V-AFS2	12	Output aux. Feeding Front S2-C2-2	OUT2-7
IBB.X20 Aux feeding S3C1					
1	24V	24V-AFS3	7	0V	0V
2	44V-ES	44V-ES-AFS3	8	0V	0V
3	0V	0V	9	Input aux. Feeding Rear S3-C1-1	IN2-8
4	EARTH	Earth	10	Input aux. Feeding Rear S3-C1-2	IN2-9
5	0V	0V	11	Output aux. Feeding Rear S3-C1-1	OUT2-8

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Pins	Description	Netname	Pins	Description	Netname
6	44V	44V-AFS3	12	Output aux. Feeding Rear S3-C1-2	OUT2-9
IBB.X21 Aux feeding S3C2					
1	24V	24V-AFS3	7	0V	0V
2	44V-ES	44V-ES-AFS3	8	0V	0V
3	0V	0V	9	Input aux. Feeding Rear S3-C2-1	IN2-10
4	EARTH	Earth	10	Input aux. Feeding Rear S3-C2-2	IN2-11
5	0V	0V	11	Output aux. Feeding Rear S3-C2-1	OUT2-10
6	44V	44V-AFS3	12	Output aux. Feeding Rear S3-C2-2	OUT2-11
IBB.X22 Aux feeding S4C1					
1	24V	24V-AFS4	7	0V	0V
2	44V-ES	44V-ES-AFS4	8	0V	0V
3	0V	0V	9	Input aux. Feeding Rear S4-C1-1	IN2-12
4	EARTH	Earth	10	Input aux. Feeding Rear S4-C1-2	IN2-13
5	0V	0V	11	Output aux. Feeding Rear S4-C1-1	OUT2-12
6	44V	44V-AFS4	12	Output aux. Feeding Rear S4-C1-2	OUT2-13
IBB.X23 Aux feeding S4C2					
1	24V	24V-AFS4	7	0V	0V
2	44V-ES	44V-ES-AFS4	8	0V	0V
3	0V	0V	9	Input aux. Feeding Rear S4-C2-1	IN2-14
4	EARTH	Earth	10	Input aux. Feeding Rear S4-C2-2	IN2-15
5	0V	0V	11	Output aux. Feeding Rear S4-C2-1	OUT2-14
6	44V	44V-AFS4	12	Output aux. Feeding Rear S4-C2-2	OUT2-15
IBB.X24 Trolleylift 1 CAN					
1	0V	0V-Bitbus1	9	0V	0V
2	N.C.	N.C.	10	N.C.	N.C.
3	CAN-L	CAN-L1	11	CAN-H	CAN-H1
4	CAN-L	CAN-L2	12	CAN-H	CAN-H2
5	CAN-GND	CAN-GND	13	V+ (24V from lift)	N.C.
6	N.C.	N.C.	14	Feeder ready section 1	IN1-8
7	TRAD1 (Trolley Address)	0V-Bitbus1	15	TRAD2 (Trolley Address)	0V-Bitbus1
8	TRAD3 (Trolley Address)	0V-Bitbus1			
IBB.X25 Trolleylift 1 ES					
1	Switch3	24V-I0	4	Switch3	IN1-12
2	Switch1	ES1-7	5	N.C.	N.C.
3	Switch1	ES1-8	6	N.C.	N.C.
IBB.X26 Trolleylift 1 Bitbus					
1		0V	9	BBA-OUT	BBA3
2	BBA-IN	BBA2	10	BBB-OUT	BBB3
3	BBB-IN	BBB2	11		N.C.
4		0V	12		N.C.
5		N.C.	13		N.C.
6		N.C.	14		N.C.
7		N.C.	15	OUT1-4	trolley exchange
8		N.C.			

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Pins	Description	Netname	Pins	Description	Netname
IBB.X27 Trolleylift 1 44V-ES					
1	44V-ES	44V-ES-LU1	4	N.C.	N.C.
2	N.C.	N.C.	5	N.C.	N.C.
3	0V	0V	6	N.C.	N.C.
IBB.X28 Trolleylift 2 CAN					
1	0V	0V-Bitbus2	9	0V	0V
2	N.C.	N.C.	10	N.C.	N.C.
3	CAN-L	CAN-L2	11	CAN-H	CAN-H2
4	CAN-L	CAN-L3	12	CAN-H	CAN-H3
5	CAN-GND	CAN-GND	13	V+ (24V from lift)	N.C.
6	N.C.	N.C.	14	Feeder ready section 2	IN1-9
7	TRAD1 (Trolley Address)	N.C.	15	TRAD2 (Trolley Address)	0V-Bitbus2
8	TRAD3 (Trolley Address)	0V-Bitbus2			
IBB.X29 Trolleylift 2 ES					
1	Switch3	24V-IO	4	Switch3	IN1-13
2	Switch1	ES1-8	5	N.C.	N.C.
3	Switch1	ES1-9	6	N.C.	N.C.
IBB.X30 Trolleylift 2 Bitbus					
1		0V	9	BBA-OUT	BBA4
2	BBA-IN	BBA3	10	BBB-OUT	BBB4
3	BBB-IN	BBB3	11		N.C.
4		0V	12		N.C.
5		N.C.	13		N.C.
6		N.C.	14		N.C.
7		N.C.	15	OUT1-4	trolley exch.
8		N.C.			
IBB.X31 Trolleylift 2 44V-ES					
1	44V-ES	44V-ES-LU1	4	N.C.	N.C.
2	N.C.	N.C.	5	N.C.	N.C.
3	0V	0V	6	N.C.	N.C.
IBB.X32 Trolleylift 3 CAN					
1	0V	0V-Bitbus3	9	0V	0V
2	N.C.	N.C.	10	N.C.	N.C.
3	CAN-L	CAN-L3	11	CAN-H	CAN-H3
4	CAN-L	CAN-L4	12	CAN-H	CAN-H4
5	CAN-GND	CAN-GND	13	V+ (24V from lift)	N.C.
6	N.C.	N.C.	14	Feeder ready section 3	IN1-10
7	TRAD1 (Trolley Address)	0V-Bitbus3	15	TRAD2 (Trolley Address)	N.C.
8	TRAD3 (Trolley Address)	0V-Bitbus3			
IBB.X33 Trolleylift 3 ES					
1	Switch3	24V-IO	4	Switch3	IN1-14
2	Switch1	ES1-9	5	N.C.	N.C.
3	Switch1	ES1-10	6	N.C.	N.C.
IBB.X34 Trolleylift 3 Bitbus					
1		0V	9	BBA-OUT	BBA5
2	BBA-IN	BBA4	10	BBB-OUT	BBB5
3	BBB-IN	BBB4	11		N.C.
4		0V	12		N.C.
5		N.C.	13		N.C.
6		N.C.	14		N.C.
7		N.C.	15	OUT1-4	trolley exch.
8		N.C.			
IBB.X35 Trolleylift 3 44V-ES					
1	44V-ES	44V-ES-LU1	4	N.C.	N.C.

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Pins	Description	Netname	Pins	Description	Netname
2	N.C.	N.C.	5	N.C.	N.C.
3	0V	0V	6	N.C.	N.C.
IBB.X36 Trolleylift 4 CAN					
1	0V	0V-Bitbus4	9	0V	0V
2	N.C.	N.C.	10	N.C.	N.C.
3	CAN-L	CAN-L4	11	CAN-H	CAN-H4
4	CAN-L	N.C.	12	CAN-H	N.C.
5	CAN-GND	CAN-GND	13	V+ (24V from lift)	N.C.
6	N.C.	N.C.	14	Feeder ready section 4	IN1-11
7	TRAD1 (Trolley Address)	N.C.	15	TRAD2 (Trolley Address)	N.C.
8	TRAD3 (Trolley Address)	0V-Bitbus4			
IBB.X37 Trolleylift 4 ES					
1	Switch3	24V-I0	4	Switch3	IN1-15
2	Switch1	ES1-10	5	N.C.	N.C.
3	Switch1	ES1-11	6	N.C.	N.C.
IBB.X38 Trolleylift 4 Bitbus					
1		0V	9	BBA-OUT	N.C.
2	BBA-IN	BBA5	10	BBB-OUT	N.C.
3	BBB-IN	BBB5	11		N.C.
4		0V	12		N.C.
5		N.C.	13		N.C.
6		N.C.	14		N.C.
7		N.C.	15	OUT1-4	trolley exch.
8		N.C.			
IBB.X39 Trolleylift 4 44V-ES					
1	44V-ES	44V-ES-LU1	4	N.C.	N.C.
2	N.C.	N.C.	5	N.C.	N.C.
3	0V	0V	6	N.C.	N.C.
IBB.X40 24V Supply CA Front					
1	24V	24V-CAM	3	0V	0V
2	N.C.	N.C.			
IBB.X41 24V Supply CA Rear					
1	24V	24V-CAM	3	0V	0V
2	N.C.	N.C.			
IBB.X42 24V Supply BA1&2					
1	24V	24V-BA	3	0V	0V
2	N.C.	N.C.			
IBB.X43 Trigger CA Front					
1	Trig+	Trigger+CAF	3	Shield	Earth
2	Trig-	Trigger-CAF	4	N.C.	N.C.
IBB.X44 Trigger CA Rear					
1	Trig+	Trigger+CAR	3	Shield	Earth
2	Trig-	Trigger-CAR	4	N.C.	N.C.
IBB.X45 Trigger BA1&2					
1		N.C.	11	shield	Earth
2		N.C.	12	trigger1-	Trigger- BAF
3		N.C.	13	trigger1+	Trigger+B AF
4		N.C.	14	shield	Earth
5		N.C.	15	shield	Earth
6		N.C.	16	trigger2-	Trigger- BAR
7		N.C.	17	trigger2+	Trigger+B AR
8		N.C.	18	shield	Earth

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Pins	Description	Netname	Pins	Description	Netname
9		N.C.	19		N.C.
10		N.C.	20		N.C.
IBB.X46 LPT1 Controller					
1		N.C.	14		N.C.
2	T1-	T1-	15		N.C.
3	T1+	T1+	16		N.C.
4	T2-	T2-	17		N.C.
5	T2+	T2+	18		GND
6	T4-	T4-	19		GND
7	T4+	T4+	20		GND
8	T3-	T3-	21		GND
9	T3+	T3+	22		GND
10		N.C.	23		GND
11		GND	24		GND
12		GND	25		GND
13		N.C.			
IBB.X47 CAN from SVS controller					
1	N.C.	N.C.	6	N.C.	N.C.
2	CAN-H	CAN-H1	7	CAN-L	CAN-L1
3	CAN-GND	CAN-GND	8	N.C.	N.C.
4	N.C.	N.C.	9	N.C.	N.C.
5	N.C.	N.C.			
IBB.X48 Bitbus in from IBE					
1		N.C.	9		N.C.
2	shield	Earth	10		N.C.
3	BBB	BBB2	11		N.C.
4		0V	12		N.C.
5	Bitbus nodes OK	IN1-2	13		N.C.
6	QuickStop-BB	OUT1-5	14		N.C.
7		N.C.	15		N.C.
8	BBA	BBA2			
IBB.X49 Verification Tool					
1	N.C.	N.C.	6	Valve4	OUT1-11
2	0V	0V	7	N.C.	N.C.
3	Valve1	OUT1-8	8	N.C.	N.C.
4	Valve2	OUT1-9	9	N.C.	N.C.
5	Valve3	OUT1-10			
IBB.X50 to E-stop relay					
1	S11	ES1-14	6	contact PNOZ	24V-I0
2	S21	ES2-7	7	contact relay	ES-SP1
3	S22	ES2-1	8	contact relay	ES-SP2
4	S12	ES1-1	9	N.C	N.C.
5	contact PNOZ	IN1-3			
IBB.X51 Blower CA front/rear					
1	Valve1	OUT1-6	4	N.C.	N.C.
2	Valve2	OUT1-7	5	N.C.	N.C.
3	Common	0V	6	N.C.	N.C.
IBB.X52 24V supply I0					
1	24V	24V-I0	3	0V	0V
2	N.C.	N.C.			
IBB.X53 16 Input Module 3					
1	IN3-0	IN3-0	11	IN3-10	IN3-10
2	IN3-1	IN3-1	12	IN3-11	IN3-11
3	IN3-2	IN3-2	13	IN3-12	IN3-12
4	IN3-3	IN3-3	14	IN3-13	IN3-13
5	IN3-4	IN3-4	15	IN3-14	IN3-14

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Pins	Description	Netname	Pins	Description	Netname
6	IN3-5	IN3-5	16	IN3-15	IN3-15
7	IN3-6	IN3-6	17	0V	0V
8	IN3-7	IN3-7	18	0V	0V
9	IN3-8	IN3-8	19	24V	N.C.
10	IN3-9	IN3-9	20	24V	N.C.
IBB.X54	ES Spare				
1	Detection	24V-I0	4	Detection	IN3-2
2	Input	ES1-13	5	N.C.	N.C.
3	Input	ES1-14	6	N.C.	N.C.
IBB.X55	ES Enabling Switch Front				
1	N.C.	N.C.	4	N.C.	N.C.
2	Switch1	ES1-1	5	Switch2	ES2-1
3	Switch1	ES1-3	6	Switch2	ES2-3
IBB.X56	ES Enabling Switch Front Left				
1	N.C.	24V-I0	4	N.C.	IN1-6
2	Switch1	ES1-1	5	Switch2	ES2-1
3	Switch1	ES1-2	6	Switch2	ES2-2
IBB.X57	ES Cover Rear Left				
1	Switch3	24V-I0	4	Switch3	IN1-7
2	Switch1	ES1-3	5	Switch2	ES2-3
3	Switch1	ES1-4	6	Switch2	ES2-4
IBB.X58	Enabling Switch Rear				
1	Switch3	N.C.	4	Switch3	IN3-1
2	Switch1	ES1-3	5	Switch2	ES2-3
3	Switch1	ES1-5	6	Switch2	ES2-5
IBB.X59	ES to XY controller				
1	N.C	N.C	3	0V	0V
2	E-stop	IN1-3R			
IBB.X60	Fluxer				
1	24V	24V- FLUX	6	GND	0V
2	Fluxer ready	IN3-6	7	Fluxer claimed	OUT1-12
3	GND	0V	8	N.C.	N.C.
4	24V	24V-FLUX	9	GND	0V
5	Fluxer cover placed	IN3-7	-		

B5.3.13.1 Auxiliary feeding, connectors

- Connectors are connected to IBB, see [B5.3.12 Interconnection board base, connections](#) , connectors X16 to X23
- Fuses of the connectors, see [B5.3.11 Interconnection board base, fuses and LED signalling](#) , fuse F103 to F114

Pin	Description
A	44V-ES
B	Not connected
C	Output aux. feeding
D	Input aux. feeding
E	Input aux. feeding
F	0V
G	Not connected
H	0V
J	24V
K	EARTH
L	44V
M	0V
N	0V
O	Output aux. feeding

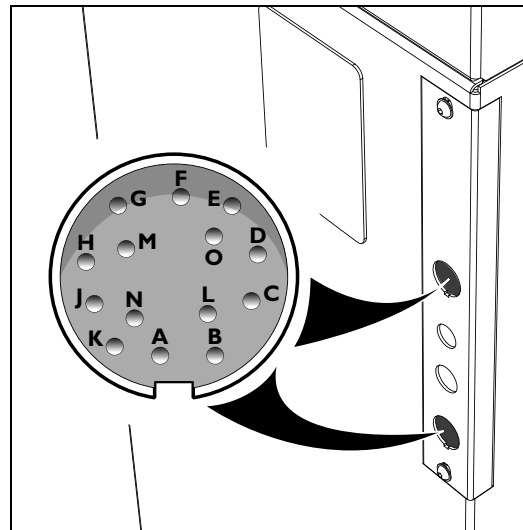


Figure 75 Auxiliary feeding, connector

B5.3.14 Interconnection board electrics, fuses and LED signalling

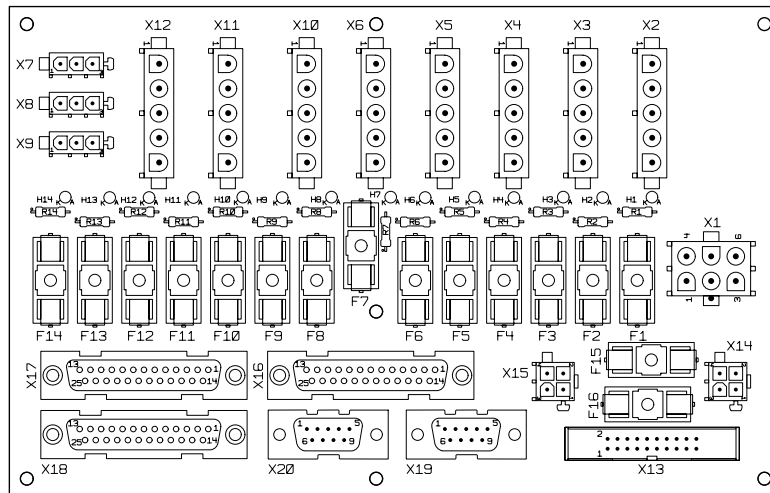


Figure 76 Interconnection board electrics

No.	Fuse	No.	LED
F1	4AT 24V supply HA head drive 1	H1	green
F2	4AT 44V-ES supply HA head drive 1	H2	green
F3	4AT 24V supply HA head drive 2	H3	green
F4	4AT 44V-ES supply HA head drive 2	H4	green
F5	4AT 24V supply Transport Controller	H5	green
F6	4AT 44V-ES supply Transport Controller	H6	green
F7	4AT 24V supply Transport Controller Piggyback	H7	green
F8	4AT 24V supply transport amplifier	H8	green
F9	4AT 44V-ES supply transport amplifier	H9	green
F10	4AT 24V supply head drive 1&2(&3)	H10	green
F11	4AT 44V-ESV supply head drive 1	H11	green
F12	4AT Fuse 44V-ESV supply head drive 2	H12	green
F13	4AT Spare (44V-ESV supply head drive 3)	H13	green
F14	4AT 24V logic supply Y1+Y2+X	H14	green
F15	4AT Z-axis HA Head 1	-	-
F16	4AT Z-axis HA Head 2	-	-

Figure 77 Interconnection board electrics, fuses and LED signalling

B5.3.15 Interconnection board electrics, connections

Board lay out, see [Figure 76. Interconnection board electrics](#)

	Function		Function
X1	Supply in 24V/44V	X11	Supply head drive 2
X2	Supply Head Controller 1	X12	Supply head drive 3
X3	Supply Head Controller 1	X13	Z motor head 1&2
X4	Supply Head Transport Controller	X14	Z drive head 1
X5	Supply Head Transport Controller Piggyback	X15	Z drive head 2
X6	Supply DCPA	X16	Bitbus head Controller 1
X7	Logic supply servo XY-robot Y1	X17	Bitbus head Controller 2
X8	Logic supply servo XY-robot Y2	X18	Bitbus Transport Controller
X9	Logic supply servo XY-robot X	X19	Bitbus to Interconnection board 1
X10	Supply head drive 1	X20	Bitbus from Computer

Figure 78 Interconnection board electrics, connections

B5.3.16 Interconnection board electrics, signals

Board lay out, see [Figure 76. Interconnection board electrics](#)

Pins	Description	Netname	Pins	Description	Netname
IBE.X1 Supply in					
1	24V	24V	4	EARTH	Earth
2	44V-ES	44V-ES	5	0V	0V
3	0V	0V	6	44V	N.C.
IBE.X2 Supply Head Controller 1					
1	24V	24V-F1	4	EARTH	Earth
2	44V-ES	44V-ES-F2	5	N.C.	N.C.
3	0V	0V			
IBE.X3 Supply Head Controller 2					
1	24V	24V-F3	4	EARTH	Earth
2	44V-ES	44V-ES-F4	5	N.C	N.C.
3	0V	0V			
IBE.X4 Supply Transport Controller					
1	24V	24V-F5	4	EARTH	Earth
2	44V-ES	44V-ES-F6	5	N.C	N.C.
3	0V	0V			
IBE.X5 Supply Piggyback Transport					
1	24V	24V-F7	4	EARTH	Earth
2	N.C	N.C.	5	N.C	N.C.
3	0V	0V			
IBE.X6 Supply DCPA					
1	24V	24V-F8	4	EARTH	Earth
2	N.C.	44V-ES-F9	5	N.C.	N.C.
3	0V	0V			
IBE.X7 logic supply servo XY-robot Y1					
1	24V	24V-F14	3	0V	0V
2	N.C.	N.C.			
IBE.X8 logic supply servo XY-robot Y2					
1	24V	24V-F14	3	0V	0V
2	N.C.	N.C.			
IBE.X9 logic supply servo XY-robot X					
1	24V	24V-F14	3	0V	0V
2	N.C.	N.C.			
IBE.X10 supply head drive 1					
1	24V	24V-F10	4	0V	Earth
2	44V-ES	44V-ES-F11	5	N.C.	0V
3	0V	0V			
IBE.X11 supply head drive 2					
1	24V	24V-F10	4	0V	Earth
2	44V-ES	44V-ES-F12	5	N.C	0V
3	0V	0V			
IBE.X12 supply head drive 3					
1	24V	24V-F10	4	0V	Earth
2	44V-ES	44V-ES-F13	5	N.C.	0V
3	0V	0V			
IBE.X13 Z motor head 1& 2					
1	N.C	N.C	11	Earth	Earth
2	N.C	N.C	12	Head1 Z+	Head1-Z+F15
3	N.C	N.C	13	Head1 Z+	Head1-Z+F15
4	Head2 Z-	Head2-Z-	14	Head1 Z+	Head1-Z+F15
5	Head2 Z-	Head2-Z-	15	Head1 Z-	Head1-Z-
6	Head2 Z-	Head2-Z-	16	Head1 Z-	Head1-Z-
7	Head2 Z+	Head2-Z+F16	17	Head1 Z-	Head1-Z-

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Pins	Description	Netname	Pins	Description	Netname
8	Head2 Z+	Head2-Z+F16	18	N.C	N.C
9	Head2 Z+	Head2-Z+F16	19	N.C	N.C
10	Earth	Earth	20	N.C	N.C
IBE.X14 Z motor head 1					
1	Head1 Z+	Head1-Z+	3	Earth	Earth
2	Head1 Z-	Head1-Z-	4	Earth	Earth
IBE.X15 Z motor head 2					
1	Head2 Z+	Head2-Z+	3	Earth	Earth
2	Head2 Z-	Head2-Z-	4	Earth	Earth
IBE.X16 Bitbus Head Controller 1					
1	OV	Earth	14	N.C.	N.C.
2	BBA	BBA	15	PCC	N.C.
3	BBB	BBB	16	PCE	N.C.
4	OV	OV	17	TCA	QuickStop-BB
5	NA00	N.C.	18	TCK	OV
6	NA01	OV	19	OV	OV
7	NA02	OV	20	24V	N.C.
8	NA03	OV	21	ATC	BB-Nodes-OK
9	NA04	OV	22	ATE	Ov
10	NA05	OV	23	ATTA	N.C.
11	NA06	OV	24	ATTK	N.C.
12	NA07	OV	25	RESX	N.C.
13	OV	OV			
IBE.X17 Bitbus Head Controller 2					
1	OV	Earth	14	N.C.	N.C.
2	BBA	BBA	15	PCC	N.C.
3	BBB	BBB	16	PCE	N.C.
4	OV	OV	17	TCA	QuickStop-BB
5	NA00	OV	18	TCK	OV
6	NA01	N.C.	19	OV	OV
7	NA02	OV	20	24V	N.C.
8	NA03	OV	21	ATC	BB-Nodes-OK
9	NA04	OV	22	ATE	OV
10	NA05	OV	23	ATTA	N.C.
11	NA06	OV	24	ATTK	N.C.
12	NA07	OV	25	RESX	N.C.
13	OV	OV			
IBE.X18 Bitbus Transport Controller					
1	OV	Earth	14	N.C.	N.C.
2	BBA	BBA	15	PCC	N.C.
3	BBB	BBB	16	PCE	N.C.
4	OV	OV	17	TCA	QuickStop-BB
5	NA00	OV	18	TCK	OV
6	NA01	OV	19	OV	OV
7	NA02	OV	20	24V	N.C.
8	NA03	OV	21	ATC	BB-Nodes-OK
9	NA04	N.C.	22	ATE	OV
10	NA05	OV	23	ATTA	N.C.
11	NA06	OV	24	ATTK	N.C.
12	NA07	OV	25	RESX	N.C.
13	OV	OV			
IBE.X19 Bitbus to IBB					
1	N.C	N.C.	6	QuickStop-BB	QuickStop-BB
2	OV (shield)	Earth	7	N.C	N.C.
3	BBB	BBB	8	BBA	BBA
4	N.C	N.C.	9	N.C	N.C.

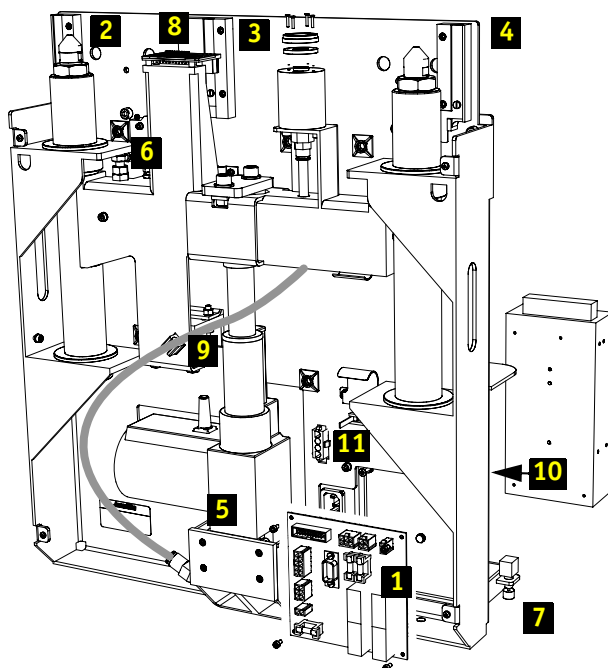
B5-00006.fm

Pins	Description	Netname	Pins	Description	Netname
5	Bitbus nodes OK	BB-Nodes-OK			
IBE.X20 Bitbus from Computer					
1	N.C	N.C.	6	N.C	N.C.
2	0V (shield)	Earth	7	N.C	N.C.
3	BBB	BBB	8	BBA	BBA
4	N.C	N.C.	9	N.C	N.C.
5	N.C	N.C.			

B5.3.17 Trolley lift, features

For the location of the items refer to the wiring diagram [B5.4.1. Trolley lift, diagram](#).

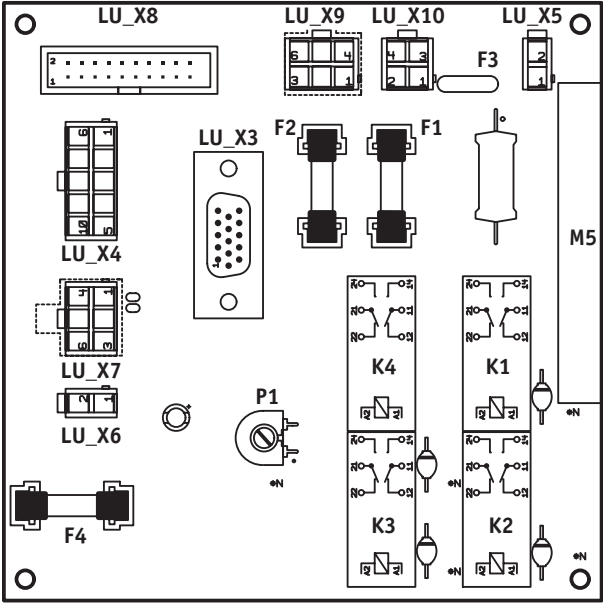
Extra information about the trolley lift controller (1), see [B5.3.17.1](#).



Item	Function	Remarks
1	Trolley lift controller	
2	Trolley 'UP' contact area	
3	Trolley 'DOWN' contact area	
4	Common trolley contact area	
5	Actuator	
6	Micro switch	
7	Service switch	Enables to remove the trolley from the trolley lift when the trolley lift does not respond to the 'down' control on the trolley.
8	Base interface board	
9	Safety interlock	The safety interlock on the trolley lift is part of the safety circuit.
10	230 VAC - 24 VDC power converter	
11	Safety circuit connection	LU-X2

B5-00006.fm

B5.3.17.1 Trolley lift controller



Item	Function
K1	Activates the actuator to move upward
K2	Activates the actuator to move downward
K3	Holds the trolley lift in the same Z-position
K4	Closes the power circuit to the trolley (2 times 24 VDC)
F1	Protects the 24 V, 4 A power supply to the tape cutter (if applicable)
F2	Protects the 24 V, 4 A power supply to the feeders
F3	Self correcting poly fuse, protects the 24 VDC to the trolley lift
F4	Spare fuse

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B5.4.1 Trolley lift, diagram

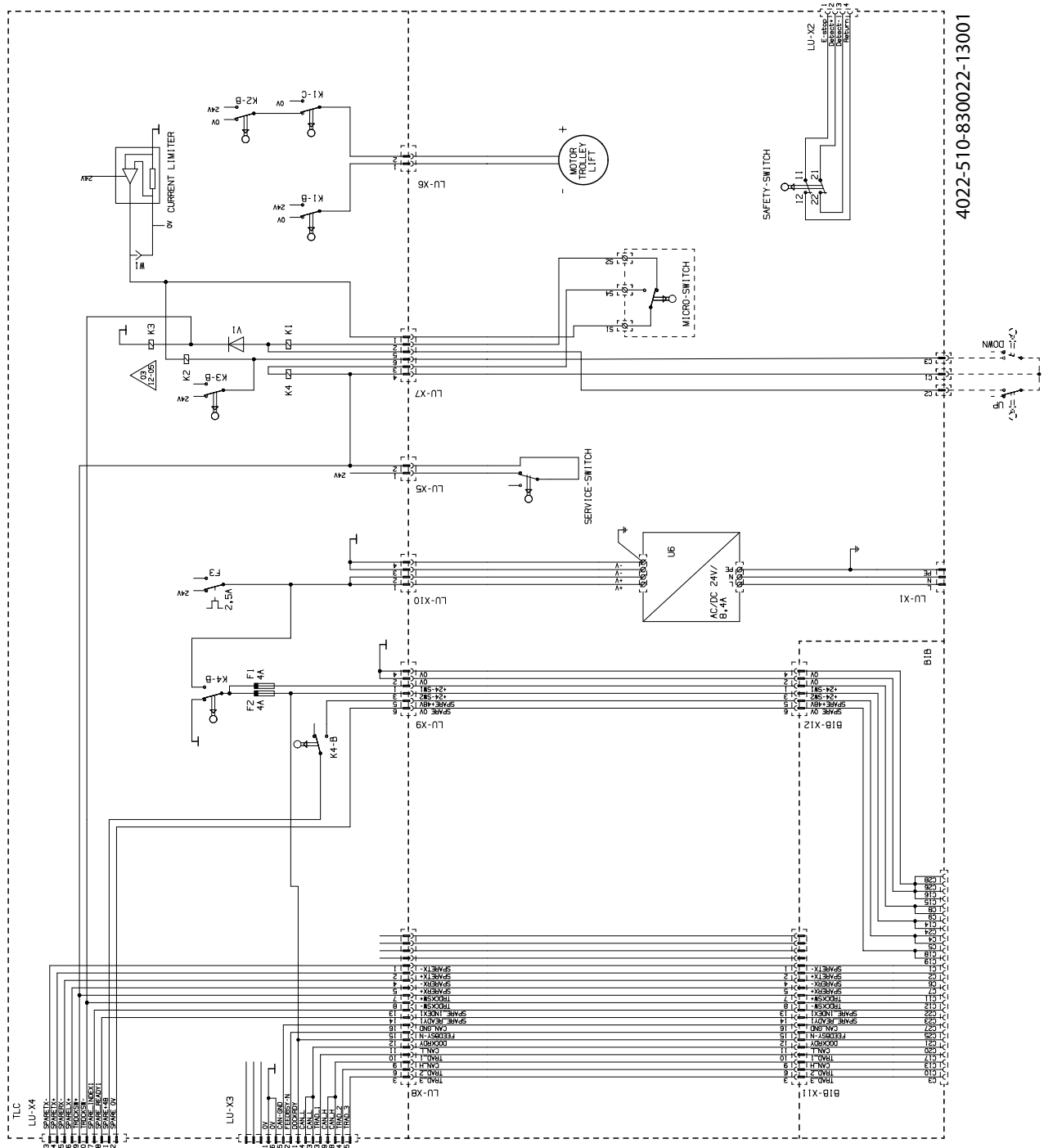


Figure 79 Trolley lift diagram

B5.4.2 Control supply unit PA 2410/01, diagram

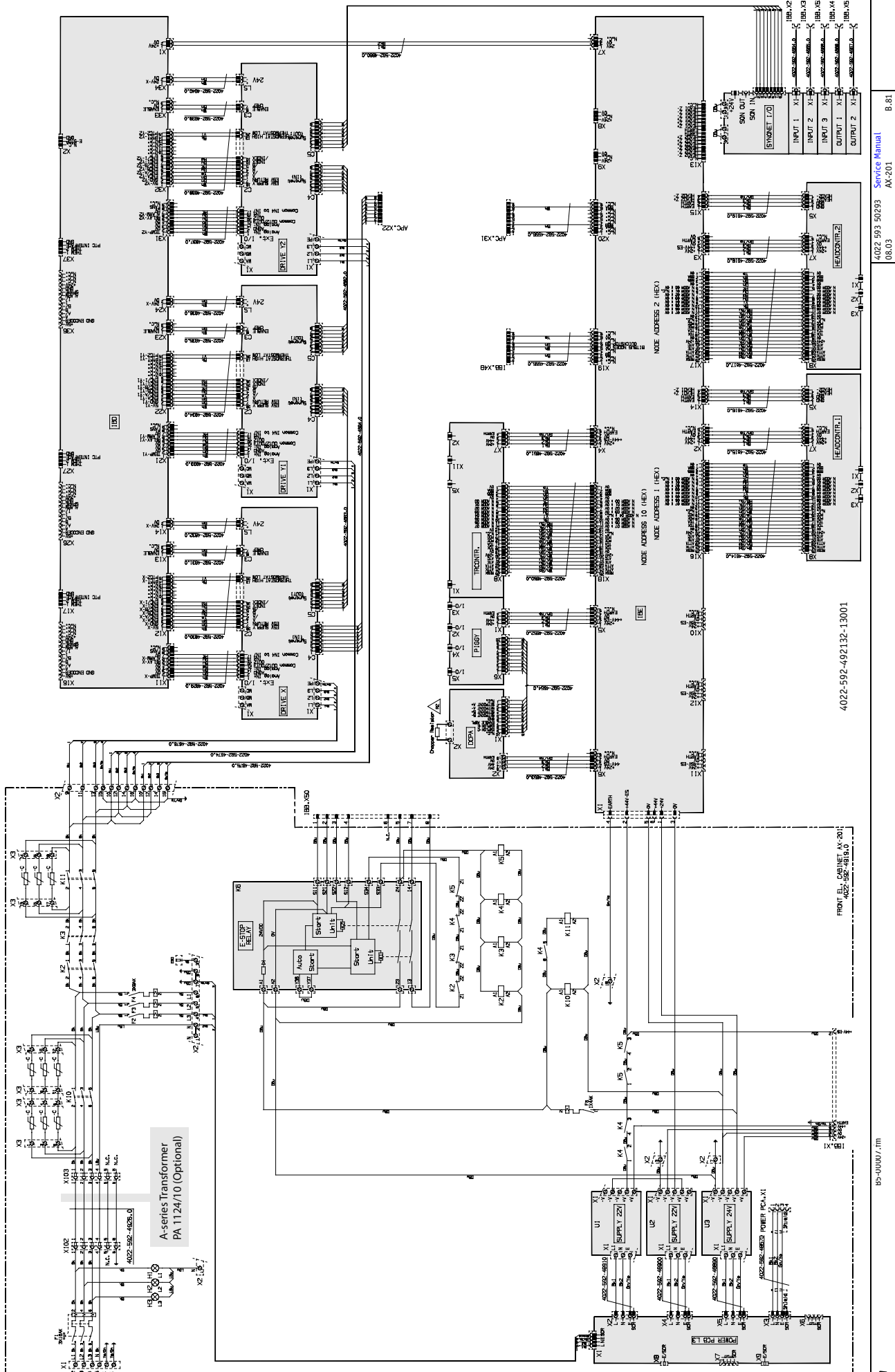


Figure 80 Control supply unit PA 2410/01, diagram

B5.4.3 Control supply unit PA 2410/00, diagram

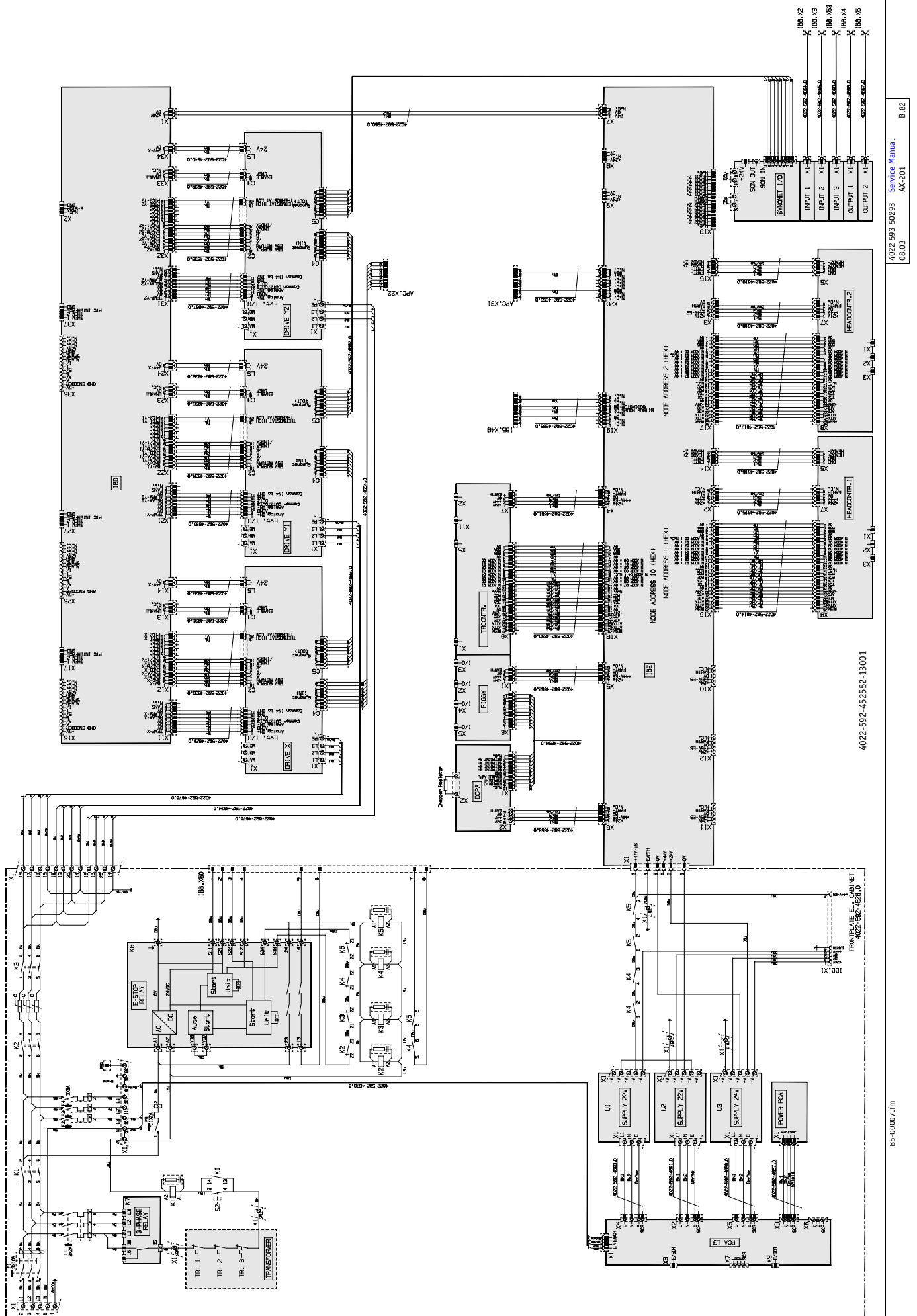


Figure 81 Control supply unit PA 2410/00, diagram

B5.4.4 A-series transformer PA 1124/10, diagram

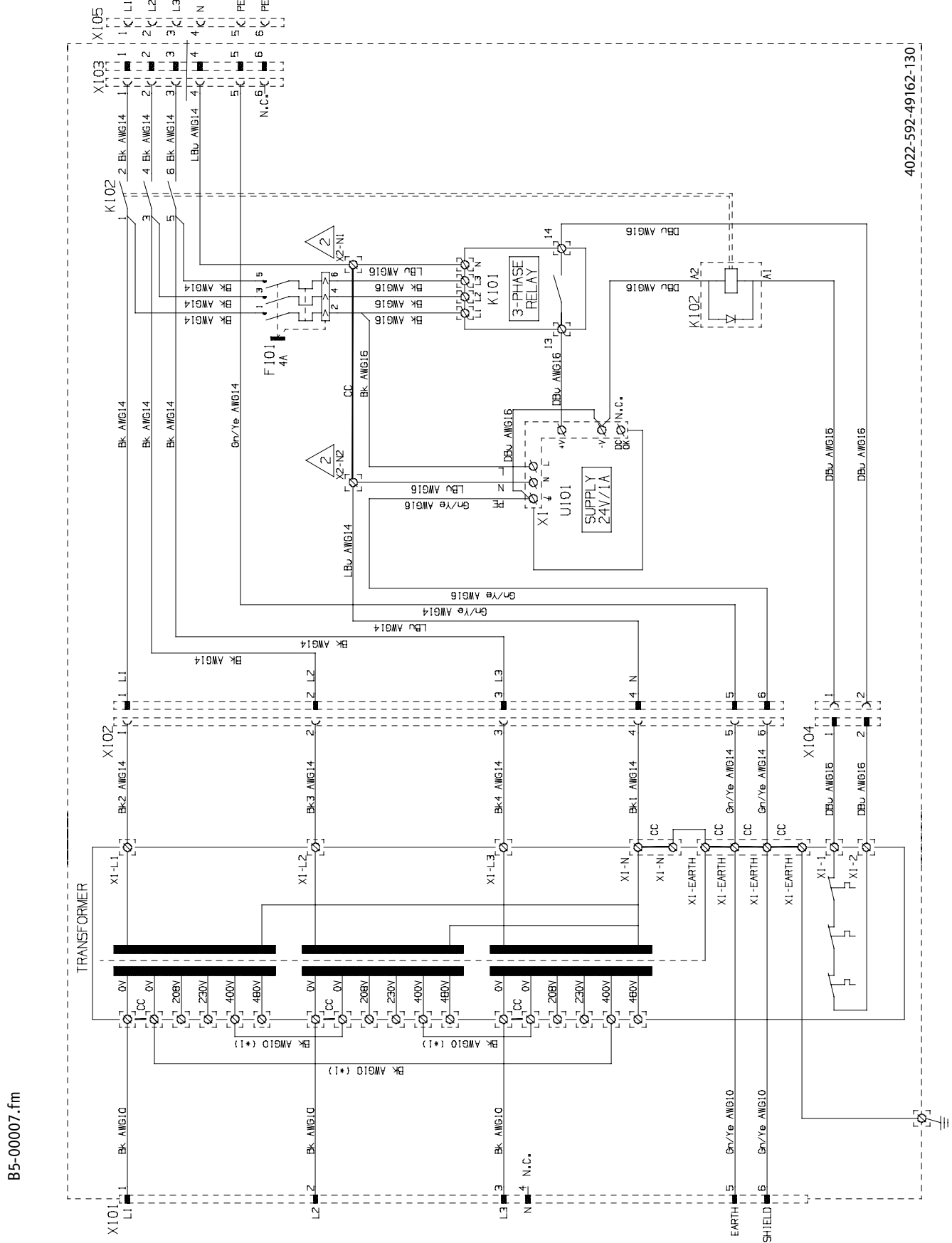


Figure 82 A-series transformer PA 1124/10, diagram

B5.4.5 Air and vacuum, diagram

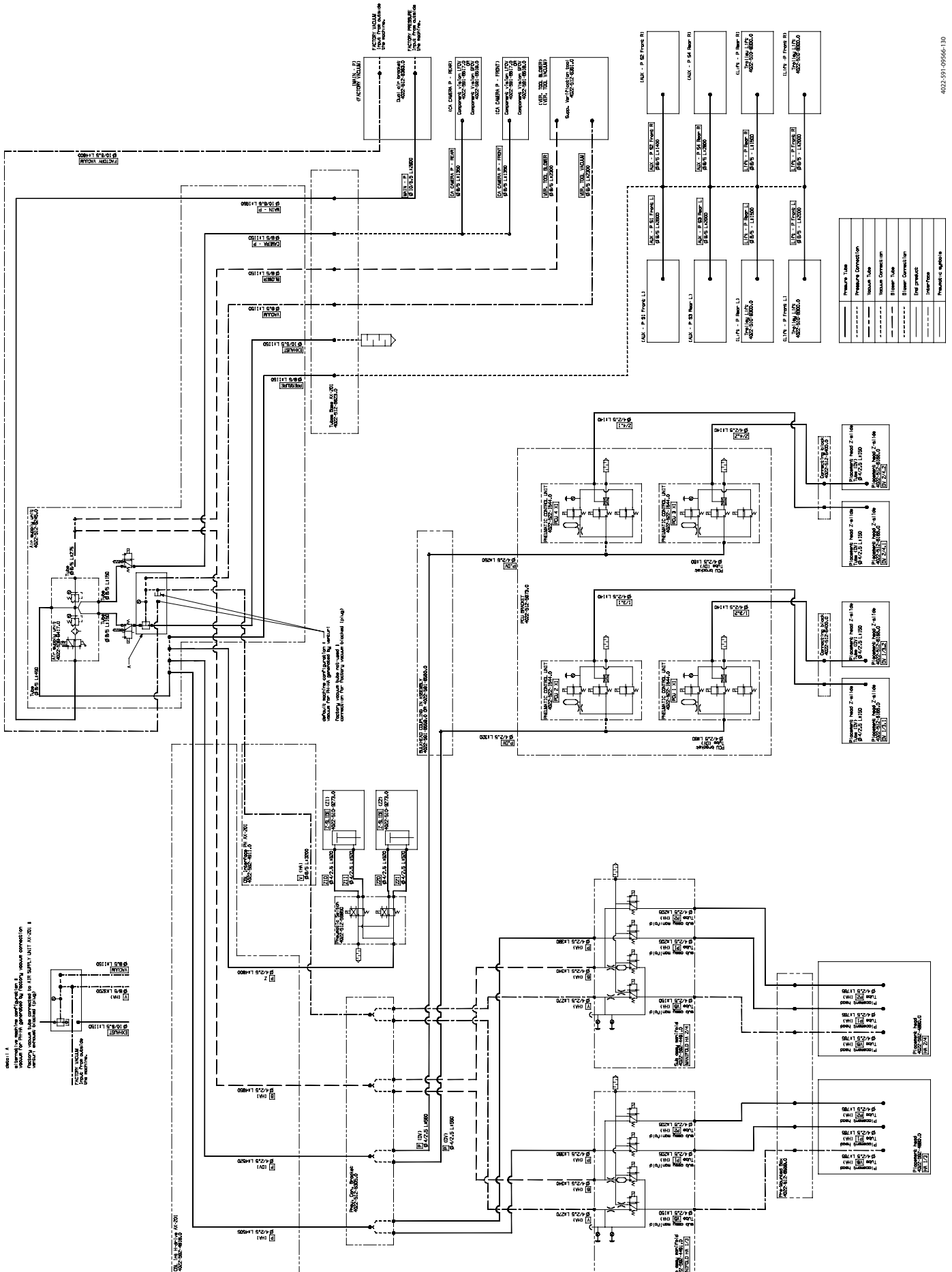


Figure 83 Air and vacuum diagram

CHAPTER B6 Measurement, adjustment and calibration

B6-00001.fm

B6.1 External network, connecting

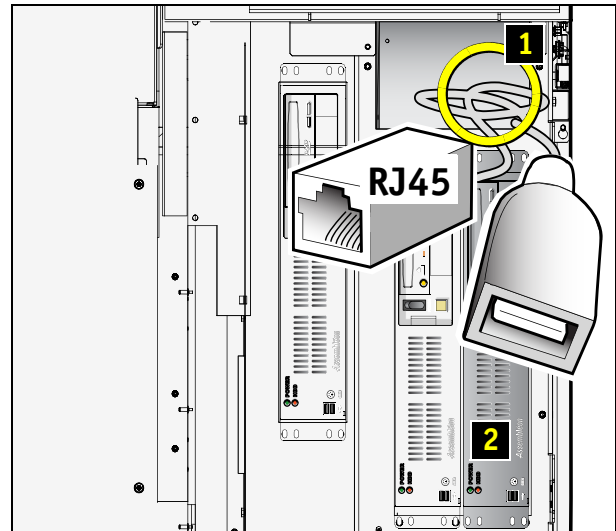
Estimated time to complete [min.]:	-
Required special tools:	-
Required part(s)	Network cable

1. Prerequisites

- Ask the local network administrator for:
 - * DHCP server used, or
 - * IP address, subnet mask and (if the machine is connected to a remote network) default gateway.

2. Connecting the network cable

The machine is pre-wired (1) for an external network connection (RJ45). This wiring is connected to connector X51 of the system controller (2).



3. Start up the system controller

- Power up the machine.
- As soon as the 'Autostart' pop-up screen appears, close this screen in order to prevent the application software to start up.
- Wait until the system controller (ASC) desktop appears, and the pop up screen (APC status window) shows 'Finished firmware validation and downloading'.
- Close the pop up screen.

4. Enable network adaptor

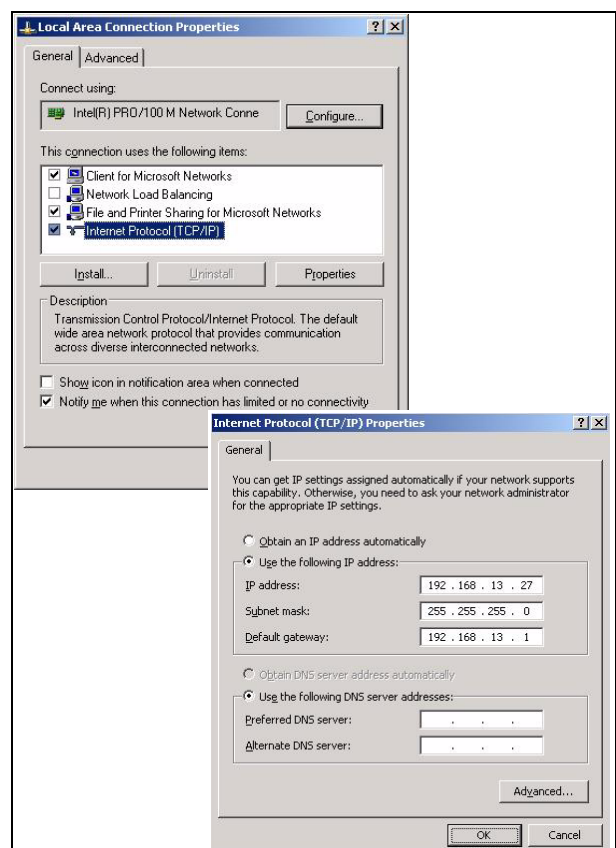
- From the ASC desktop:
Select 'Start'-'Settings'-'Network Connections'.
- Right-click 'Local Area Connection2' and select 'Properties'.
- Select 'Configure...'.
- Select 'Use this device (enable)' and select 'OK'.

5. Set IP address

- Select 'Internet Protocol (TCP/IP)' and select 'Properties'.
- Enter the correct IP address, subnet mask for the customer's network and default gateway (if the machine is connected to a remote network).
(In case of DHCP select 'Obtain an IP address automatically'.)
- Select OK to accept the changes.

6. Finalize

- Shut down and re-start the machine.



Network.fm

B6.2 Touch screen, calibrating

Estimated time to complete [min.]: 5
Required special tools: -
Required part(s) -

1. Calibrating the touch screen (only front side)

- Go to 'Desktop' and select 'Start' - Control Panel' - 'ELO Touch screen.
- Select the calibration button.
- Touch the screen on the target.
- Repeat three times.

- Make a circle on screen with your finger. If the mouse pointer follows your finger, click the OK icon.

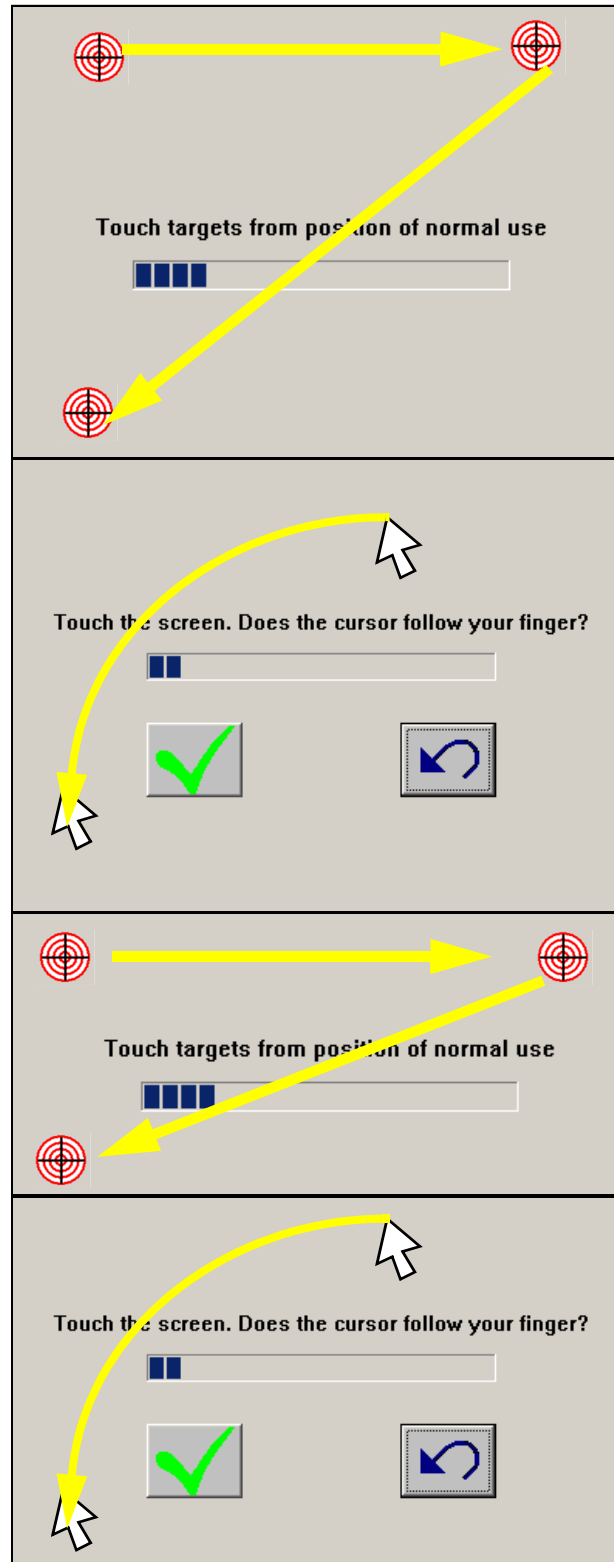
Note: If two touch screens are present on the machine, this procedure has to be executed twice. Once on the front side, once on the rear side.

2. Calibrating two touch screens (front and rear side)

FRONT

- Go to 'Desktop' on the front side touch screen and select 'Touch screen Calibration' icon.
- Touch the screen on the target.
- Repeat three times.
- Make a circle on screen with your finger.
- If the mouse pointer follows your finger, click the OK icon.

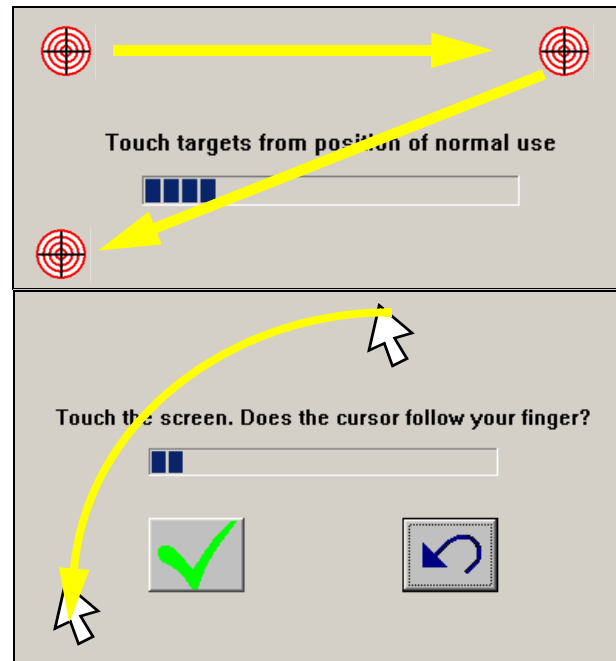
Note: Do not touch the front side screen any more
• Walk over to the rear side touch screen.



REAR

- Touch the rear side touch screen on the target.
- Repeat three times.

- Make a circle on the rear side touch screen with your finger.
- If the mouse pointer follows your finger, click the OK icon.



B6.3 Mains supply, connecting

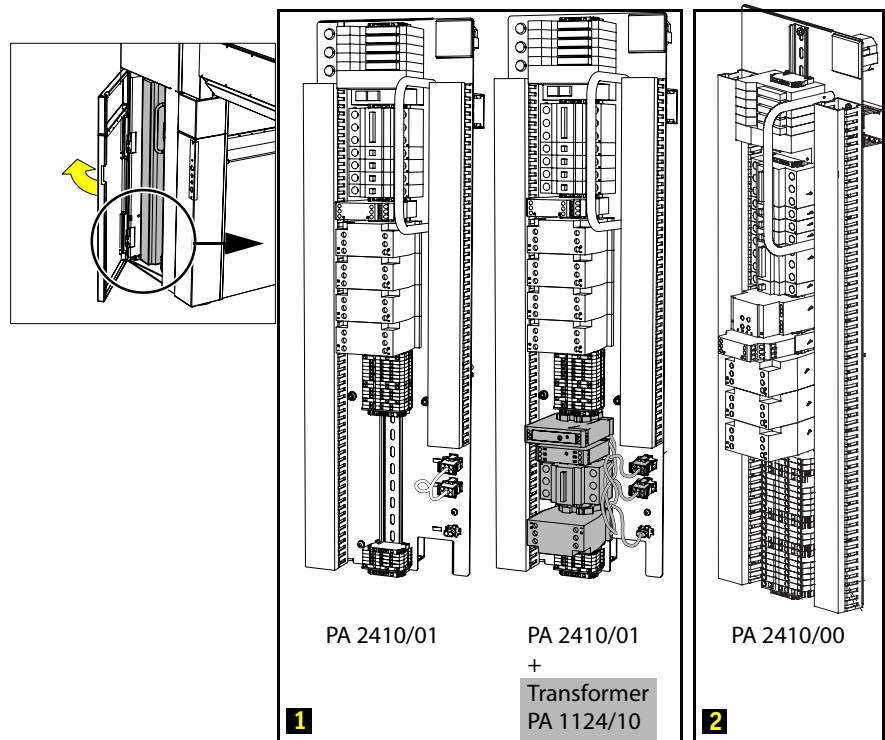


Figure 84 Overview

1. Machine **without** standard transformer.
The transformer (PA 1124/10) can be installed as an option.
See [B6.3.1 Connecting the machine to the mains, PA 2410/01](#)
2. Machine **with** standard transformer.
See [B6.3.2 Connecting the machine to the mains, PA 2410/00](#)

B6.3.1 Connecting the machine to the mains, PA 2410/01

Estimated time to complete [min.]: -
 Required special tools. Panel key [A8.6.4 Setup tooling kit \(PA 2435/00\)](#)
 Required part(s) -



DANGER, HIGH VOLTAGE PRESENT AFTER MAIN SWITCH OFF
 Contact may cause electric shock or burn.
 Turn off and lock factory fuses that supply power to the machine.



NOTE: Connecting to the mains is only allowed by competent qualified personnel.

1. Specifications

	Without transformer	With transformer
Voltage configuration	3-phases, Neutral and ground	3-phases and ground
Frequency	50 - 60 Hz	50 - 60 Hz
Frequency stability	± 2%	± 2%
Maximum power consumption	7 kVA	7 kVA
Nominal mains voltage ± 10% (between phases)	400 Volts	208 230 400 480 Volts
Corresponding full load current	10 Amp.	19 18 10 8 Amp.
Corresponding external fuse	16 Amp.	20 20 16 16 Amp.
External fuse type	Slow-blow "D-type"	Slow-blow "D-type"
Inrush current	≤ 150 Amp. (5 msec)	≤ 150 Amp. (5 msec)
Power factor	≥ 0.85	≥ 0.85
Line voltage fluctuation	According to EN 60204 and IEC 60204: Voltage Steady state voltage: 0.9 ... 1.1 of nominal voltage. Frequency 0.99 ... 1.01 of nominal frequency continuously; 0.98 ... 1.02 short time. Harmonics Harmonic distortion not to exceed 10 % of the total r.m.s. voltage between live conductors for the sum of the second through to the fifth harmonic. An additional 2 % of the total r.m.s. voltage between live conductors for the sum of the sixth through to the 30th harmonic is permissible. Voltage unbalance Neither the voltage of the negative sequence component nor the voltage of the zero sequence component in three-phase supplies shall exceed 2 % of the positive sequence component. Voltage interruption Supply interrupted or at zero voltage for not more than 3 ms at any random time in the supply cycle. There shall be more than 1 s between successive interruptions. Voltage dips Voltage dips shall not exceed 20 % of the peak voltage of the supply for more than one cycle. There shall be more than 1 s between successive dips.	

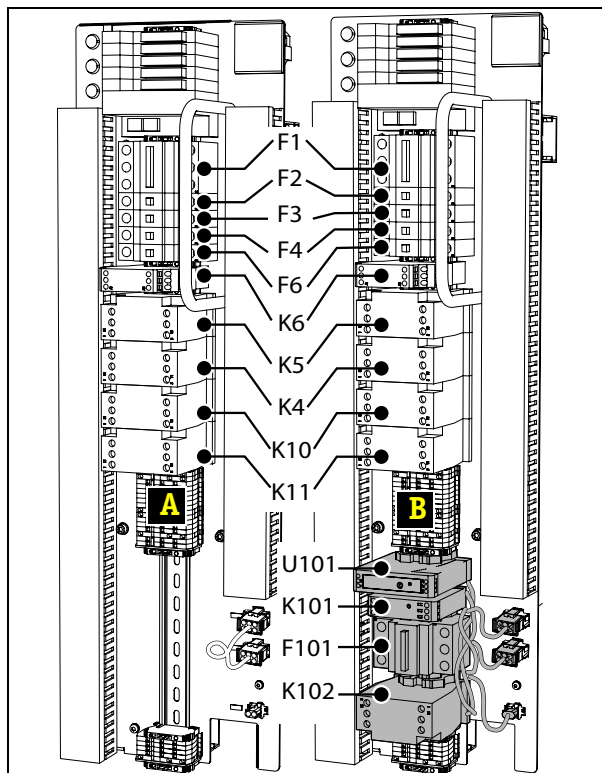
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Mains cable

Connection to facility power supply system shall be made by a 4 or 5 -core cable type and cross-section according to appropriate international standard or local regulatory requirement. E.g. AWG 12.

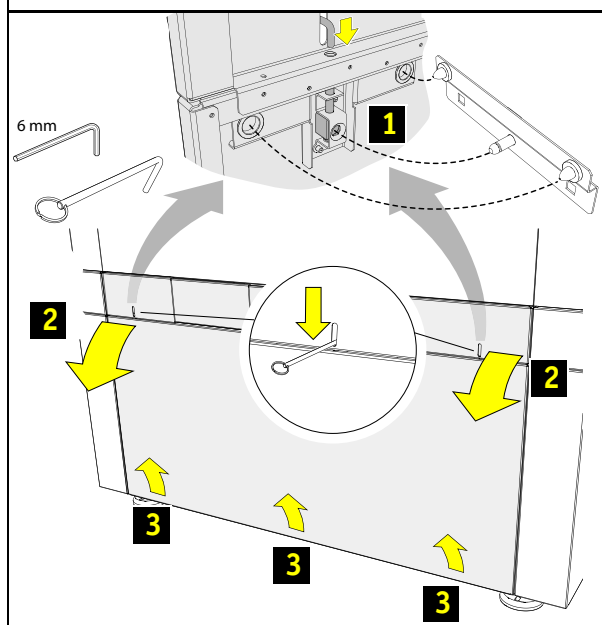
2. Precautions

- Switch off the electrical main switch.
- Ensure that the mains supply to the machine is inactive by removing the relevant factory fuses.
- **Machine without transformer (A):**
 - * Open all circuit breakers: F1, F2, F3, F4 and F6.
 - * Continue with step 5. [Remove the main switch cover .](#)
- **Machine with transformer (B):**
 - * Open all circuit breakers: F101, F1, F2, F3, F4 and F6.
 - * Continue with step 3. [Remove panel at the left side of the base](#)



3. Remove panel at the left side of the base

- Release both catches (1).
Use the panel key from the setup tooling kit, or use a 6 mm Allen key.
- Move the panel forward (2) and take it from the three lower fixating points (3).



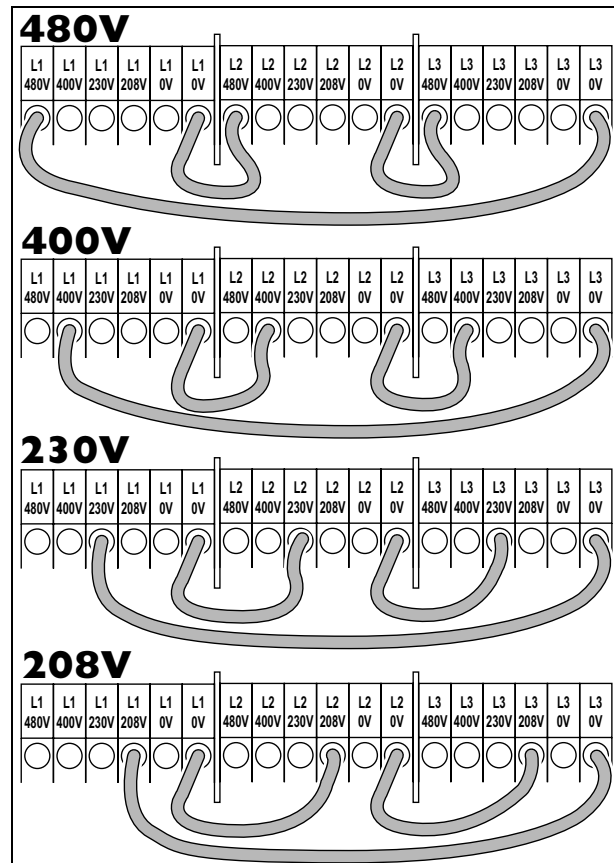
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4. Adapting machine to mains voltage

- Measure the factory voltage between the phase L1, L2, L3 and change the settings of the machine if necessary.

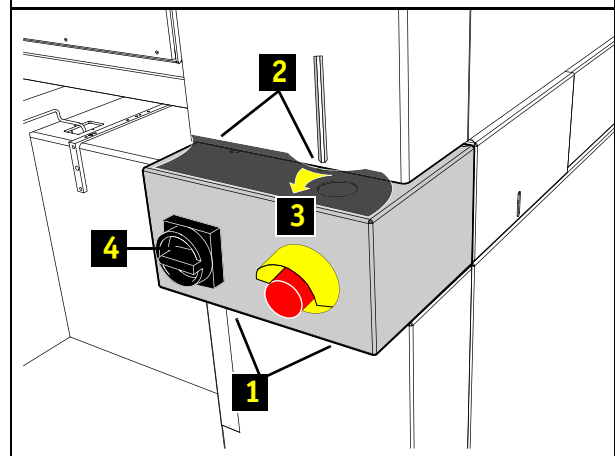
Note: If the measured voltage differs more than 10% of one of the values listed, then the customer must take measures to adapt the local power supply to the required configuration.

- Mount panel at the left side of the base.



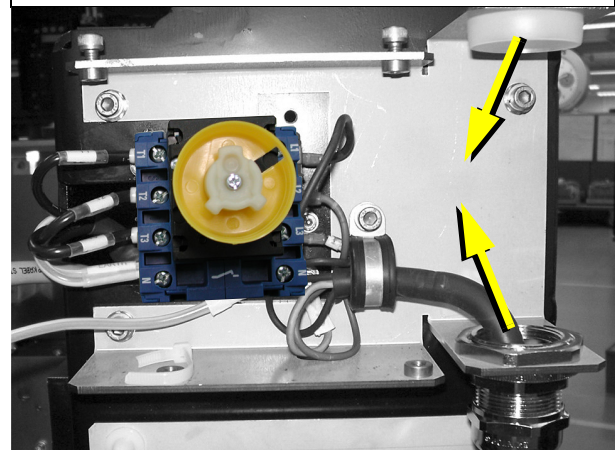
5. Remove the main switch cover

- Remove the two bolts (1) from underneath.
- Loosen the two bolts (2) on top, turn over the cover (3).
- Turn the main switch (4) in the 'OFF' position and put the cover aside.



6. Leading the power supply cable

- Route the mains cable through a separate metal duct or pipe. This duct or pipe must be grounded, to avoid EMI (electromagnetic interference) problems.
- Safety: Do not route signal cables through this duct or pipe.
- Lead the power supply cable through the cover (bottom/top).



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7. Connect the power supply cable

- Tightening torque 1.2 - 1.6 Nm.

Cable	Power supply	
Ground	ground screw	
Neutral	N	Only for machines without transformer
Phase 1	L1	
Phase 2	L2	
Phase 3	L3	

- Install the main switch cover.

8. Switching on and checking the mains

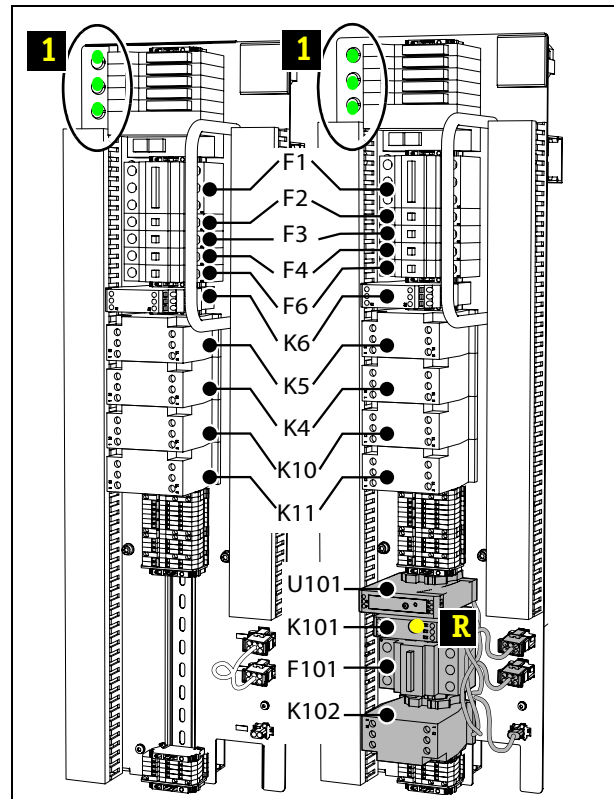
- Check if the factory fuses are slow blow before connecting the machine to the mains. These fuses must not be loaded by other heavy consumption.
- Be sure the main power is still off.
- Switch on circuit breaker (F101 and) F1 in the control supply.
- Set the main switch to on.
- Lamps on control supply must be on (1).
- Machines with transformer, go to step 9. [Check status phase guard relay \(K101\)](#)
- Switch on circuit breakers (F2, F3, F4 and F6) one by one.

9. Check status phase guard relay (K101)

Only valid for machines with transformer.

Note: The phase detection LED (R) on the phase guard relay must be on, indicating that the three phases are present.

- Switch on circuit breakers (F2, F3, F4 and F6) one by one.



B6.3.2 Connecting the machine to the mains, PA 2410/00

Estimated time to complete [min.]: -
 Required special tools. Panel key [A8.6.4 Setup tooling kit \(PA 2435/00\)](#)
 Required part(s) -



DANGER, HIGH VOLTAGE PRESENT AFTER MAIN SWITCH OFF

Contact may cause electric shock or burn.
 Turn off and lock factory fuses that supply power to the machine.



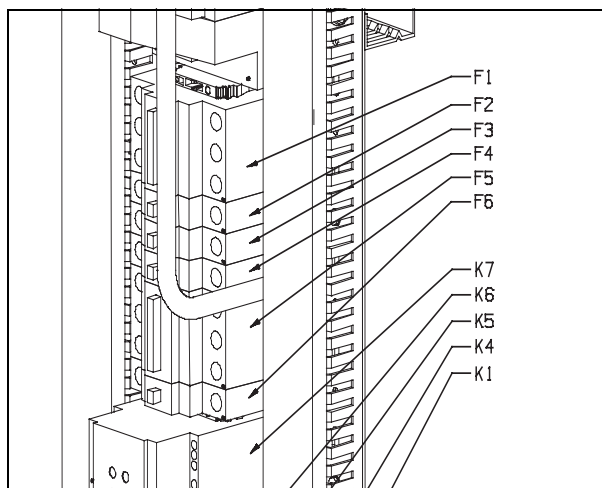
NOTE: Connecting to the mains is only allowed by competent qualified personnel.

AX-201	
Voltage configuration	3-phases and ground
Frequency	50 - 60 Hz
Frequency stability	± 2%
Maximum power consumption	7 kVA
Nominal mains voltage ± 10% (between phases)	208 230 400 480 Volts
Corresponding full load current	19 18 10 8 Amp.
Corresponding external fuse	20 20 16 16 Amp.
External fuse type	Slow-blow "D-type"
Inrush current	≤ 150 Amp. (5 msec)
Power factor	≥ 0.85
Line voltage fluctuation	<p>According to EN 60204 and IEC 60204:</p> <p>Voltage Steady state voltage: 0.9 ... 1.1 of nominal voltage.</p> <p>Frequency 0.99 ... 1.01 of nominal frequency continuously; 0.98 ... 1.02 short time.</p> <p>Harmonics Harmonic distortion not to exceed 10 % of the total r.m.s. voltage between live conductors for the sum of the second through to the fifth harmonic. An additional 2 % of the total r.m.s. voltage between live conductors for the sum of the sixth through to the 30th harmonic is permissible.</p> <p>Voltage unbalance Neither the voltage of the negative sequence component nor the voltage of the zero sequence component in three-phase supplies shall exceed 2 % of the positive sequence component.</p> <p>Voltage interruption Supply interrupted or at zero voltage for not more than 3 ms at any random time in the supply cycle. There shall be more than 1 s between successive interruptions.</p> <p>Voltage dips Voltage dips shall not exceed 20 % of the peak voltage of the supply for more than one cycle. There shall be more than 1 s between successive dips.</p>
Mains cable	Connection to facility power supply system shall be made by a 4-core cable type and cross-section according to appropriate international standard or local regulatory requirement. E.g. AWG 12.

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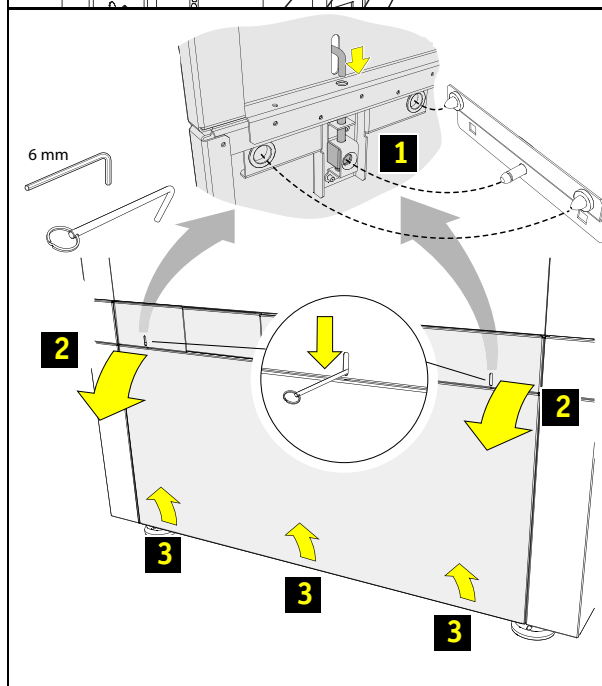
1. Precautions

- Switch off the electrical main switch.
- Ensure that the mains supply to the machine is inactive by removing the relevant factory fuses.
- Open all circuit breakers: F1, F2, F3, F4, F5 and F6.



2. Remove panel at the left side of the base

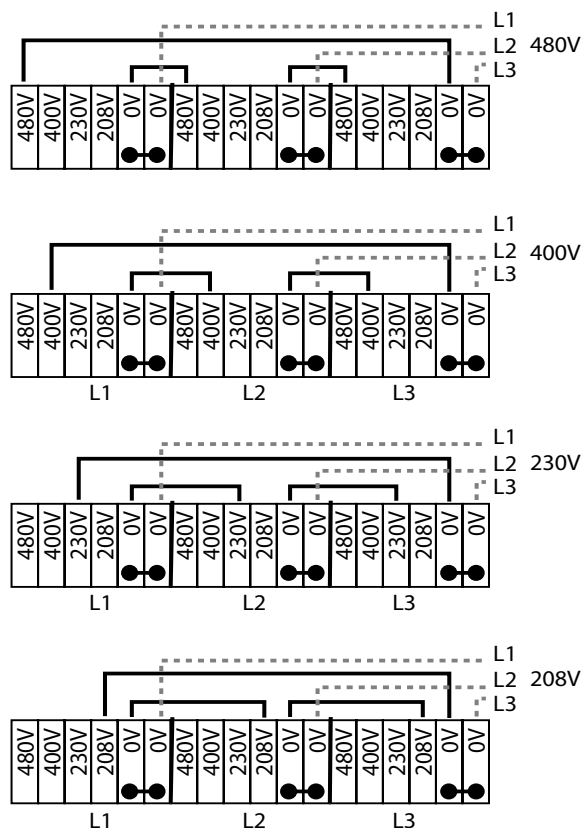
- Release both catches (1).
Use the panel key from the setup tooling kit, or use a 6 mm Allen key.
- Move the panel forward (2) and take it from the three lower fixating points (3).



3. Adapting machine to mains voltage

- Measure the factory voltage between the phase L1, L2, L3 and change the settings of the machine if necessary.
- Check and change the interconnections of the transformer if necessary, see step 4.

Note: If the measured voltage differs more than 10% of one of the values listed, then the customer must take measures to adapt the local power supply to the required configuration.



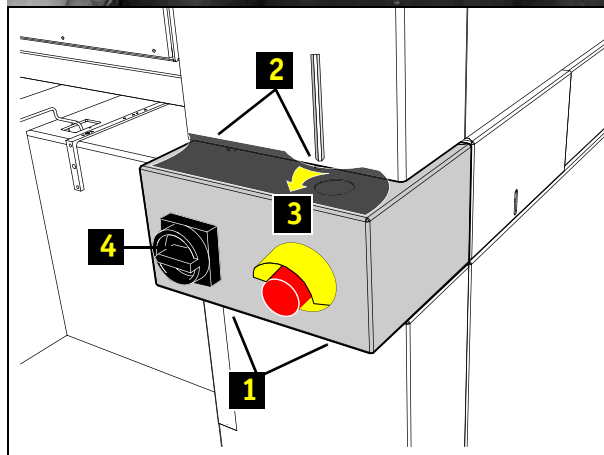
4. Setting the transformer

- See step 3 for the settings.



5. Remove the mains switch cover

- Remove the two bolts (1) from underneath.
- Loosen the two bolts (2) on top, turn over the cover (3).
- Turn the mains switch (4) in the 'OFF' position and put the cover aside.



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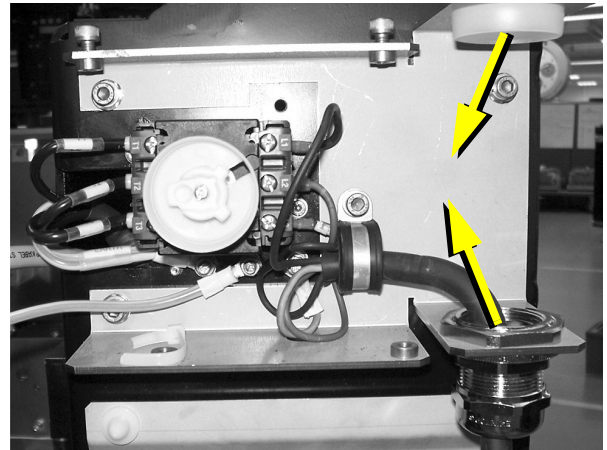
6. Leading the power supply cable

- Route the mains cable (4 x 2.5 mm² max., diameter max. 16 mm) through a separate metal duct or pipe.
This duct or pipe must be grounded, to avoid EMI (electromagnetic interference) problems.
- Safety: Do not route signal cables through this duct or pipe.
- Lead the power supply cable through the cover (bottom/top).

7. Mounting the power supply cable

- Tightening torque 1.2 - 1.6 Nm

Cable	Power supply
Ground	ground screw
Phase 1	L1
Phase 2	L2
Phase 3	L3

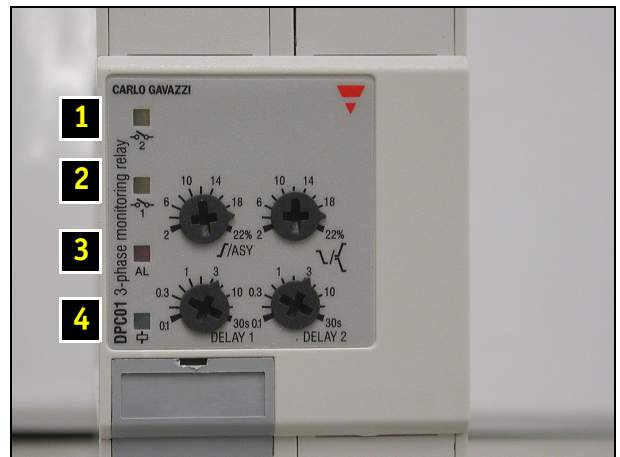


8. Switching on and checking the mains

- Check if the factory fuses are 16A slow blow before connecting the machine to the mains. These fuses must not be loaded by other heavy consumption.
- Be sure the main power is still off.
- Measure the power between L1, L2 and L3.
- Switch on circuit breaker F1 and F5 in the control supply.
- Set the main switch to on.
- LED 1,2 and 4 must be on.

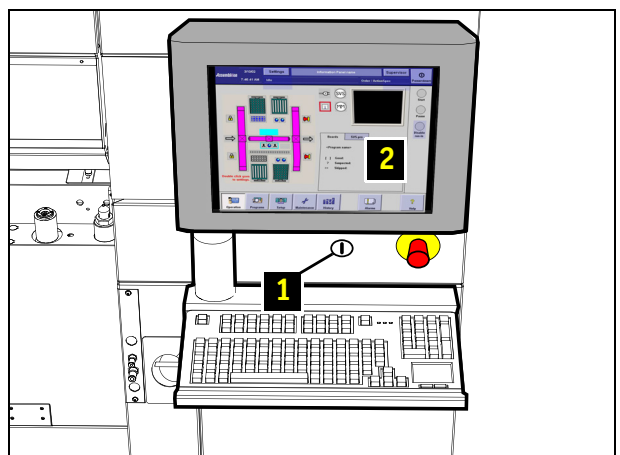
Note: The phase-detection LED (3) on the phase guard relay must be off, indicating that the three phases are present.

- If the LED (3) is on, interchange two phases on the connectors L1 to L3 at the electrical main switch, see step 7.
- Mount the mains switch cover, see step 5.
- Switch on circuit breakers (F2, F3, F4 and F6) one by one.



9. Start up the machine

- Go to the front of the machine.
- Push the start button (1).
- Wait until the main screen (2) appears.



B6.4 Digital pressure switch, check and adjust settings

B6.4.1 Digital pressure switch, check setting

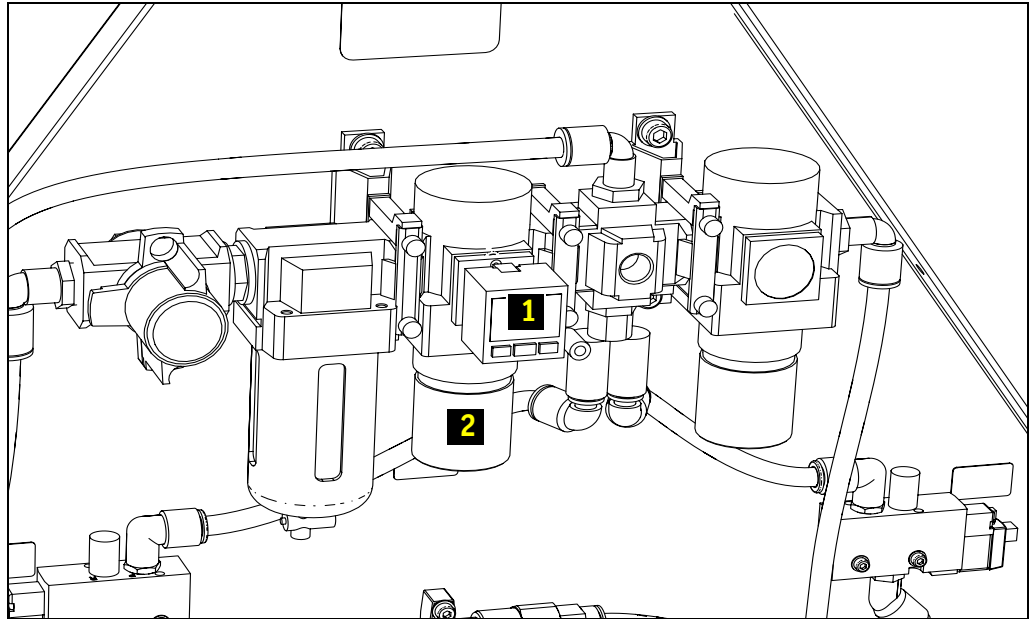


Figure 85 Digital pressure switch and clock gauge

Open the rear left upper door of the base and check the behaviour of the switch by changing the compressed air pressure using the regulator knob (2 in figure 85).

1. Unlock the knob of the regulator (2) by pulling it downwards.
Change the pressure by turning it.
2. Increase the pressure to approximately 6.9 bar (1) and verify that the indicator on the display turns RED at 6.4 bar (1).
3. Reduce the pressure to approximately 4 bar (1) and verify that the indicator on the display is RED.
4. Increase the pressure back to 5.9 bar (1) and verify that the indicator on the display changes to GREEN at 5.4 bar (1) and stays GREEN at 5.9 bar (1).
5. Lock the knob of the regulator (2) by pushing it upwards.
 - When the behaviour of the digital pressure switch is OK, the settings are correct.
 - When the behaviour of the switch is NOK, the settings have to be adjusted. Use the 'Adjust settings' procedure below.

B6-00004.fm

B6.4.2 Digital pressure switch, adjust settings

B6.4.2.1 Digital pressure switch in 'measure' mode, unlocking or locking

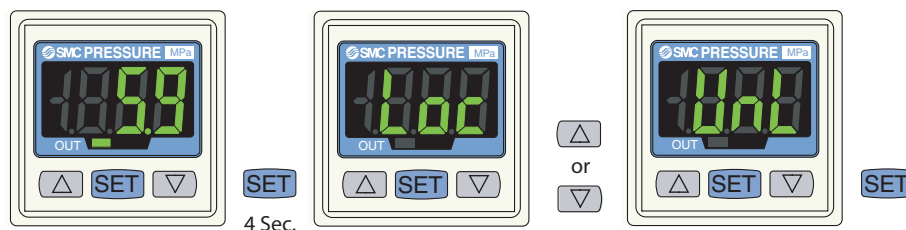


Figure 86 Digital pressure switch, unlocking or locking

- Press 'SET' for more than 4 seconds until the display shows 'UnL' (unlocked) or 'Loc' (locked).
- Press the ▲ or ▼ button to select the desired status: 'UnL' or 'Loc'.
- Press the 'SET' button.

B6.4.2.2 Digital pressure switch in 'initial set' mode, adjustment

In this mode the output type, response time and display colour can be changed.

Press 'SET' for more than 2 seconds until bAr, Psi, PA or GF is displayed.

The display is set from 'measure' mode to 'initial set' mode.

1. Unit conversion setting:

- Press the ▲ or ▼ button till 'bAr' is visible on the display.
- Press the 'SET' button again.

2. Display colour setting:

- Press the ▲ or ▼ button till 'SoG' is visible on the display.
- Press the 'SET' button again.

3. Operating mode setting:

- Press the ▲ or ▼ button till 'HYS' is visible on the display.
- Press the 'SET' button again.

4. Output type setting:

- Press the ▲ or ▼ button till 'nC' is visible on the display.
- Press the 'SET' button again.

5. Response time setting:

- Press the ▲ or ▼ button till '160' is visible on the display.
- Press the 'SET' button again.

6. Manual or automatic setting:

- Press the ▲ or ▼ button till 'mAn' is visible on the display.
- Press the 'SET' button again.

The display returns from Initial set mode to Measure mode.

B6.4.2.3 Digital pressure switch in 'pressure set' mode, adjustment

In this mode the set values for switch points can be changed.

Press 'SET' (less than 2 seconds) Display goes from 'measure' mode to 'pressure set' mode.

Alternatively 'P_1' and a value is visible in the display.

1. Set the value to '5.50', see [B6.4.2.4. Digital pressure switch, setting a value.](#)
2. Press the 'SET' button.

Alternatively 'H' and a value, is visible in the display.

3. Set the value to '0.00', see [B6.4.2.4. Digital pressure switch, setting a value.](#)
4. Press the 'SET' button.

The display returns from 'pressure set' mode to 'measure' mode.

5. Lock the display, see [B6.4.2.1. Digital pressure switch in 'measure' mode, unlocking or locking.](#)

B6.4.2.4 Digital pressure switch, setting a value

The digital pressure switch must be in 'pressure set' mode, see [B6.4.2.3.](#)

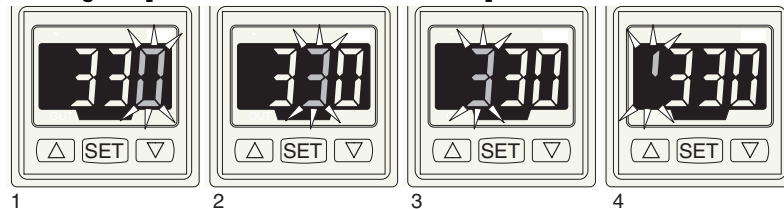


Figure 87 Digital pressure switch, setting a value

1. Press the ▲ or ▼ button to change the set value. The first digit blinks. Press the ▲ or ▼ button to set the value arbitrarily.
2. With every push on the 'SET' button, the next digit blinks.
3. With every push on the 'SET' button, the next digit blinks.
4. When the left-most digit is zero, 'I' or 'L' will blink. If the 'SET' button is pressed while the left-most digit is blinking, the right-most digit will now blink.

B6.4.2.5 Digital pressure switch, accuracy check

During normal operation (measuring mode) the digital pressure switch (1) must show roughly the same pressure as the clock gauge (2) ± 0.5 bar.

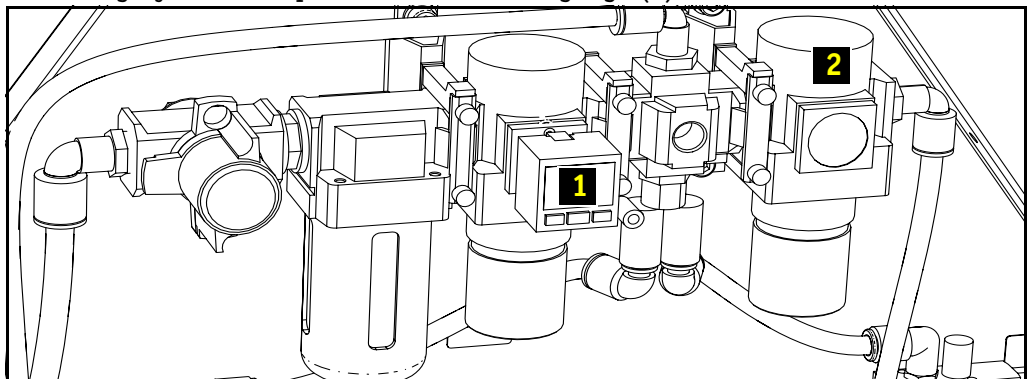


Figure 88 Digital pressure switch and clock gauge

If there is a difference, the digital pressure switch can be reset, see [chapter B6.4.2.6 "Digital pressure switch, reset the pressure registration"](#).

B6.4.2.6 Digital pressure switch, reset the pressure registration

The digital pressure switch can be reset if there is no system pressure.

- Unlock the digital pressure switch, see [B6.4.2.1. Digital pressure switch in 'measure' mode, unlocking or locking](#)
- Press the ▲ or ▼ button simultaneously till the value on the display is set to zero.

B6.4.2.7 Digital pressure switch, peak/bottom display

After unlocking the digital pressure switch, the measured min. or max. pressure can be held on the display.

- Activating peak/bottom display.
Keep the ▲ or ▼ button pressed more than 1 sec. The display shows the min. or max. pressure flashing.
- De-activating peak/bottom display.
Keep the ▲ or ▼ button pressed more than 1 sec.

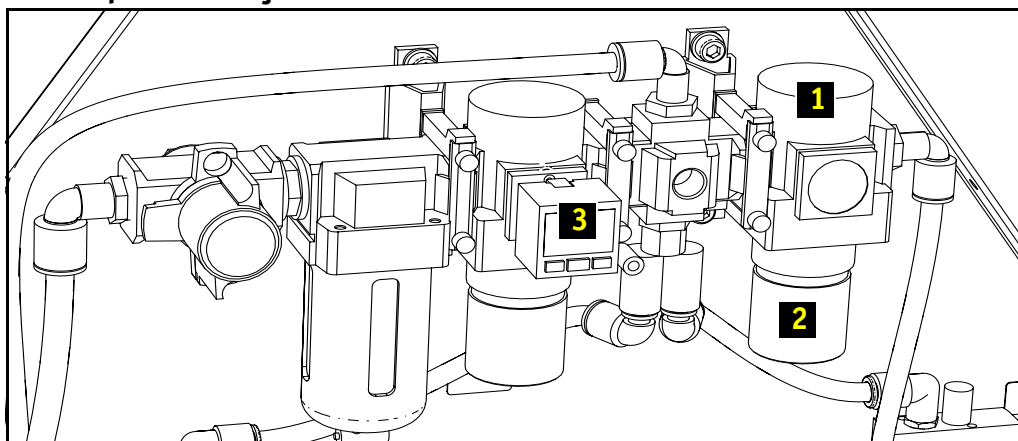
B6.4.2.8 Blower pressure adjustment

Figure 89 Blower pressure adjustment

Check if system pressure (3) is available (5.9 Bar).

Turn the knob (2) to 2.5 Bar (1).

B6.4.3 Digital vacuum switch (ZSE30-01-65), setting procedure

For installing the digital pressure gauge on the system the following setting procedure should be followed.

1. Unlock the system
 - Press the SET button for more than 4 seconds until **UnL** (unlock mode) or **Loc** (lock mode) is visible on the display
 - Press the ▲ or ▼ button until **UnL** is visible on the display.
 - Press the SET button.
(The system is unlocked).
2. Initial settings
 - Press the SET button for more than 2 seconds.
bAr, PSi, inH, nnH, PA or GF becomes visible on the display
(the system has gone from the *Measure mode* into the *Initial set mode*)
 - Press the ▲ or ▼ button until **bAr** is visible on the display.
(Unit Bar is selected)
 - Press the SET button.
Sor, SoG, rEd or Grn becomes visible on the display.
 - Press the ▲ or ▼ button until **SoG** is visible on the display.
(Green/ON is selected)
 - Press the SET button
HYS or wnd becomes visible on the display
 - Press the ▲ or ▼ button until **HYS** is visible on the display.
(Hysteresis operation mode is selected)
 - Press the SET button.
no or nC becomes visible on the display.
 - Press the ▲ or ▼ button until **nC** is visible on the display.
(Normally open output mode is selected)
 - Press the SET button.
2.5, 20, 160, 640 or 1280 becomes visible on the display
 - Press the ▲ or ▼ button until **160** is visible on the display.
(Response time of 160 ms is selected)
 - Press the SET button.
AUt or mAn becomes visible on the display
 - Press the ▲ or ▼ button until **mAn** is visible on the display.
(Manual set mode is selected)
 - Press the SET button.
(The system has switched from the *Initial set mode* into the *Measure mode*).
3. Pressure settings
 - Press the SET button.
Alternatively **n_1** and a value is visible on the display.
(The system has gone from the *Measure mode* into the *Pressure set mode*).
 - Press the ▲ or ▼ button until **-.750** is visible on the display.
The value will increase or decrease one digit per push on the button. The value will increase or decrease continually while keeping the button pushed.
(Upper pressure set point of -0.75 Bar for output 1 is selected)
 - Press the SET button.
Alternatively **H** and a value is visible on the display
 - Press the ▲ or ▼ button until **.000** is visible on the display.
(Hysteresis set for .000 Bar is selected)

B6-00004.fm

4. Lock the system

- Press the Set button for more than 4 seconds until **UnL** (unlock mode) is visible on the display.
- Press the ▲ or ▼ button until **LoC** (lock mode) is visible on the display
- Press the SET button.
(The system is locked against accidental operator actions).



NOTE: In the *Measuring mode* while the system is still unlocked and the operator presses ▲ or ▼ button for more than 1 second, the system switches to the *Peak* or *Bottom display mode*. In these modes the max. or min. pressure value will be held on a flashing display. To switch back to *Measure mode*, press the ▲ or ▼ button for more than 1 second once more.

CHAPTER B7 Maintenance instructions



NOTE: Operation, adjustment, maintenance and repair of this machine shall be carried out by **qualified and trained** personnel only.

This chapter contains detailed (corrective and preventive) maintenance instructions.

The preventive maintenance intervals are defined in [A7.3 Preventive maintenance schedule](#) .

For Material Safety Data Sheets, see [A2.12 Material safety data sheets \(MSDS\)](#)

B7.1 Touch screen and keyboard, cleaning

Estimated time to complete [min.]: 2

Required special tools. Fibre free tissue, household glass cleaner

Required part(s) -

1. Prerequisites

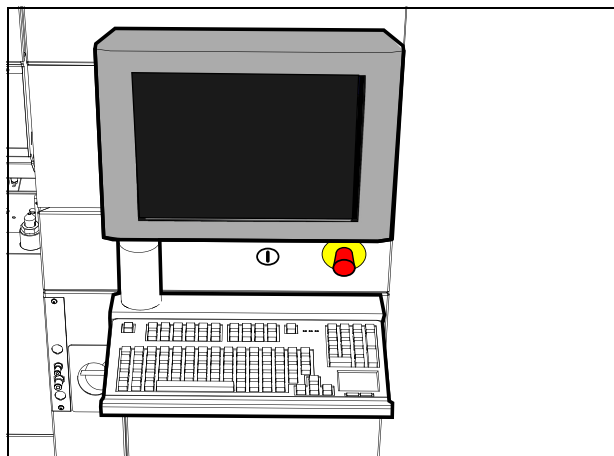
- Log out (preventing unwanted actions).

2. Cleaning the touch screen(s)

- Dampen fibre free tissue with household glass cleaner and clean the touch screen(s).

3. Cleaning the keyboard and pad

- Take the keyboard out of the holder and hold the keyboard upside down to remove dust.
- Dampen fibre free tissue with household glass cleaner and clean the keyboard and pad.



B7.2 Protection hoods, cleaning

Estimated time to complete [min.]:	5
Required special tools.	Vacuum cleaner, fibre free tissues, household glass cleaner
Required part(s)	-

1. Prerequisites

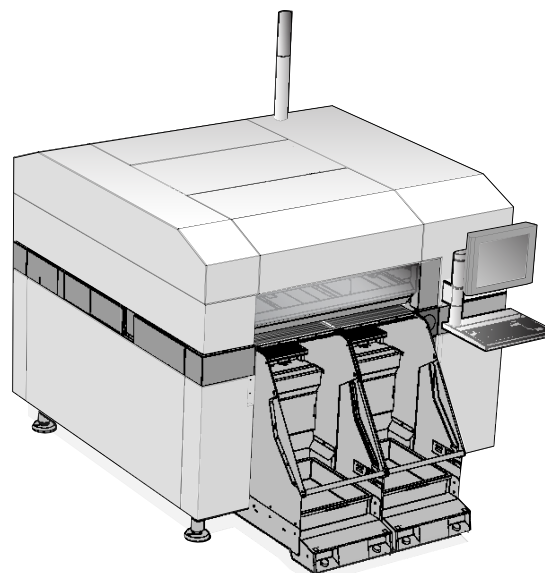
- Close hoods.
- Log out (preventing unwanted actions).
- Use a stepstool if necessary.

2. Cleaning the protection hoods

- Use a soft haired vacuum cleaner or hand broom to remove the dust.

Note: Do not use compressed air.

- Dampen fibre free tissue with household glass cleaner and clean the hoods.

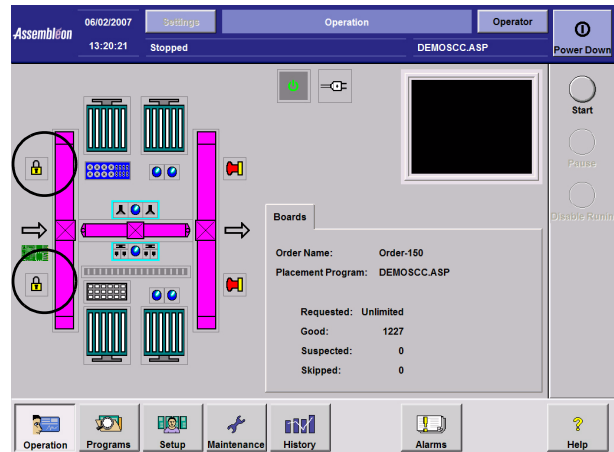


B7.3 Safety contacts on front and rear cover, checking

Estimated time to complete [min.]: 2
 Required special tools. -
 Required part(s) -

1. Check function of safety contacts

- Power up the machine.
- Operate the 'power on' push-button.
- Open a cover.
 The monitor shows the safety cover opened.
- Repeat the procedure for each safety cover.



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B7.4 Air supply unit, draining

Estimated time to complete [min.]: 5

Required special tools. -

Required part(s) -



DANGER OF STRONG MAGNETIC FIELD

Pacemaker and metal prosthetic users are at risk of serious injury or death. Stay away from the magnets.

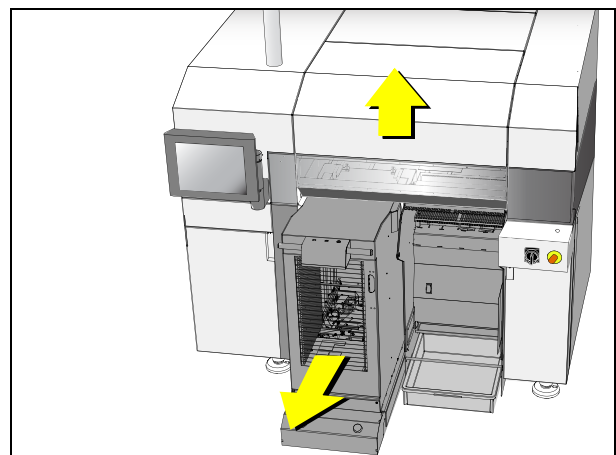


HIGH AIR PRESSURE

Uncontrolled release of air pressure may cause injury. Turn off and lock out system before servicing, see Safety chapter .

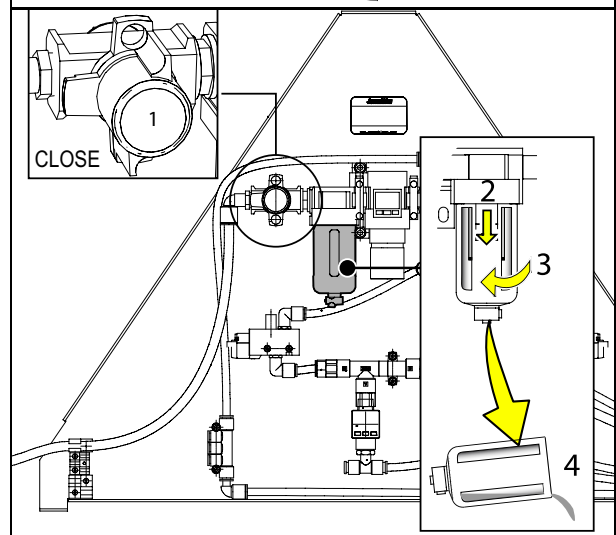
1. Prerequisites

- If present, remove the rear right trolley.
- Power down the machine.
- Open the rear cover.



2. Draining the filter

- Check and if necessary, drain the air filter.
- Close main valve (1).
- Press knob (2) down and remove the bowl (3).
- Drain and clean the bowl (4). Clean inside of the bowl (read cleaning instructions on the bowl surface).
- Place the bowl back with the knob in a 45° angle.
- Rotate bowl until the knob points towards you.
- Open the main valve (1).
- Check for air leakage.



3. Finalize

- Power up the machine.
- When removed, install the rear right trolley.

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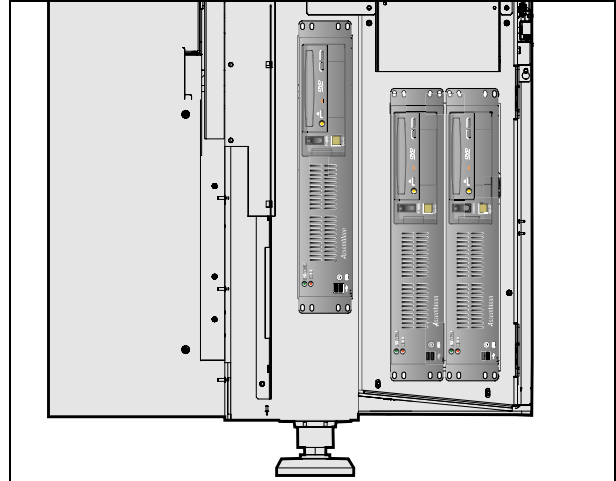
B7.5 Filter in controllers, replacement

Estimated time to complete [min.]:	2
Required special tools.	Vacuum cleaner
Required part(s)	Filters, see A8.4.1 Controllers, spares

1. Prerequisites

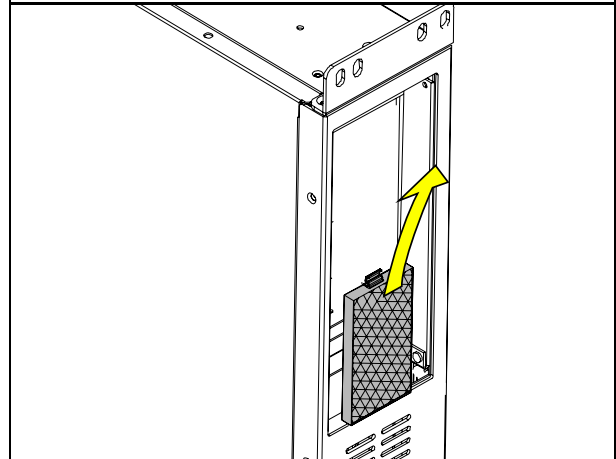
- Open the front door.

2. Clean the area with a vacuum cleaner



3. Replace the filter in the controllers

- Replace the filters by sliding a new filter inside the controller.



B7.6 Filter in air supply unit, replacement

Estimated time to complete [min.]: 10

Required special tools: -

Required part(s) Filter, see [A8.4.5 Air supply unit, spares](#)

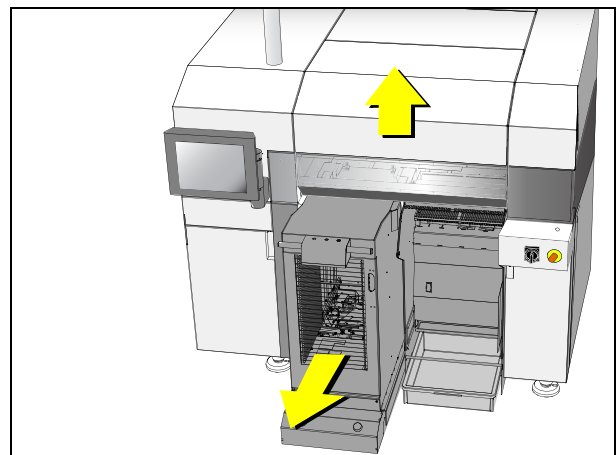


DANGER OF STRONG MAGNETIC FIELD

Pacemaker and metal prosthetic users are at risk of serious injury or death. Stay away from the magnets.

1. Prerequisites

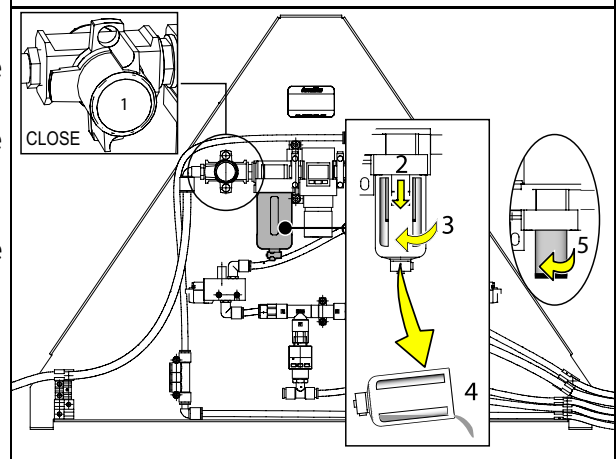
- If present, remove the rear right trolley.
- Power down the machine.
- Open the rear cover.



2. Remove air filter

WARNING: Be careful with metal objects close to the strong magnets of the XY robot.

- Close main valve (1). The remaining air pressure in the system is released.
- Press knob (2) down and remove the bowl (3).
- Drain and clean the bowl (4). Clean inside of the bowl (read cleaning instructions on the bowl surface).
- Remove filter element (5).



3. Install new air filter

- Place and tighten the new filter element (5).
- Place bowl (4) back with the knob in a 45° angle.
- Rotate bowl until the knob points towards you.
- Open main valve (1).
- Check for air leakage.

4. Finalize

- Power up the machine.
- When removed, install the rear right trolley.

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B7.7 Gauges on air supply unit, checking

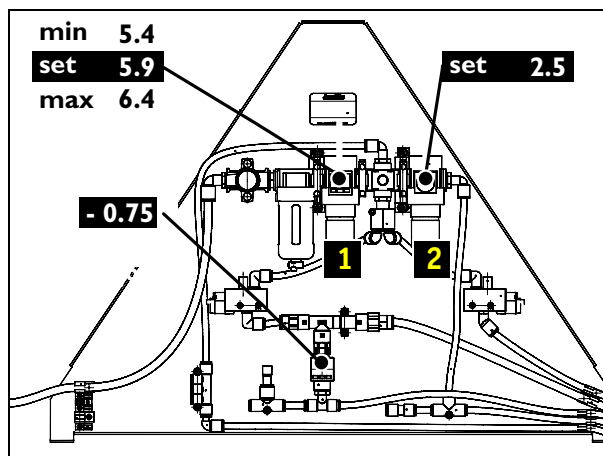
Estimated time to complete [min.]: 2

Required special tools.

Required part(s)

1. Check gauges on the air supply unit

- Check if both gauges show the correct values.
- Adjust the gauges (1,2) if necessary, see [B6.4 Digital pressure switch, check and adjust settings](#)



CHAPTER B8 Installation and replacement instructions

B8.1 Base and base modules, repair policy

See [A8.1 Repair policy](#) .

B8.2 Controller (system or process), replacement

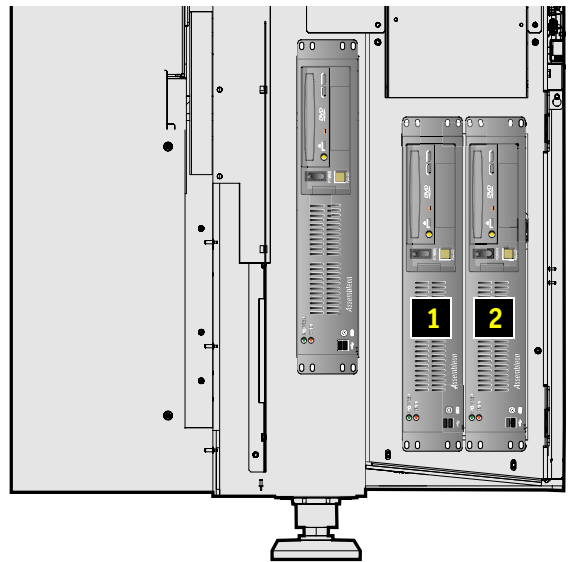
Estimated time to complete [min.]:	45
Required special tools.	-
Required part(s)	A8.4.1 Controllers, spares

1. Prerequisites

- Back up application data,
see [B8.5 Application data, back up](#)
- Back up remaining data,
see [B8.7 BI, BTCO, SVS Pro, Traceability data,
back up and restore](#)
- Power down the machine.
- Open the front door.
- Process controller = 1,
System controller = 2.

2. Remove controller

- Remove the 4 bolts that secure the controller (5mm Allen key)
- Carefully slide out the controller. Attached cables at the rear of the controller may be obstructed. When cables are obstructed try removing both controllers (1 and 2) or side plate.



3. Install controller

- Connect the cables, see [B5.3.2 Controllers, connections](#)
- Tighten the 4 bolts that secure the controller.
- Install software and restore back ups.
see [B8.3 Operating software, installation](#) and
[B8.4 Application software and online documentation, installing](#)

4. Finalize

- Send back the controller in the original packaging.

B8.3 Operating software, installation

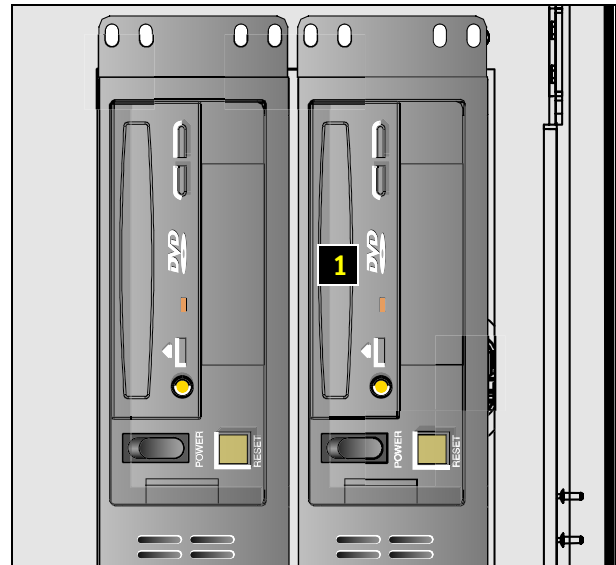
Estimated time to complete [min.]: 30
Required special tools. -
Required part(s) -

1. Preparation

- When connected to an external network:
Write down the IP settings, see [B6.1 External network, connecting](#)
- Back up application data, see [B8.5 Application data, back up](#)
- Back up remaining data, see [B8.7 BI, BTCO, SVS Pro, Traceability data, back up and restore](#)

2. Install the OS image

- Place the CD 'AX-201 Operating System Images 2.1' in the CD drive of the system controller (1).
- Select 'Power Down'.
- As soon as the GUI shows that it is safe to switch off; switch off with the mains switch.
- Power up the machine.
- After start up the screen shows 'installation Image 2.1';
- Press any key to continue.
- Wait until the installation is complete. (100%).
- Remove the CD from the CD drive (1).
- Power down the machine (mains switch).
- Power up the machine.



3. Check second touch screen

- Check if the second touch screen is working
- Touch the screen.
- If the mouse pointer is following your finger, it is working.
If not:
- Install the touch screen driver. See [B8.3.1 Touch screen driver, installing](#) for installation procedure.

4. Finalize

- Connect external network, see [B6.1 External network, connecting](#)
- Restore application data, see [B8.6 Application data, restore](#)
- Restore remaining data, see [B8.7 BI, BTCO, SVS Pro, Traceability data, back up and restore](#)
- Check on the GUI if the calibration is still valid.

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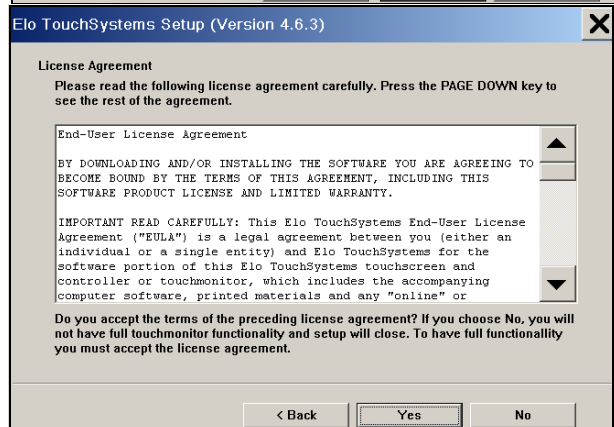
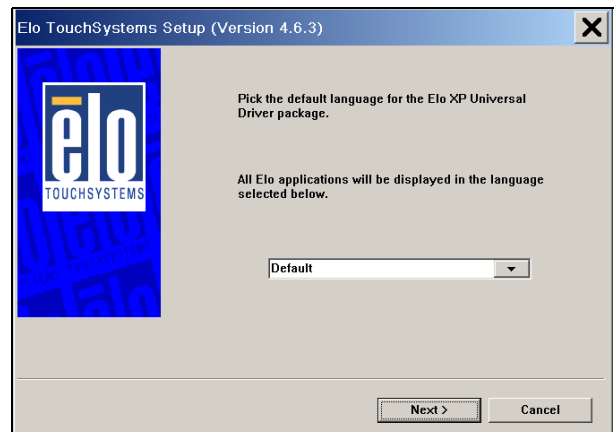
B8.3.1 Touch screen driver, installing



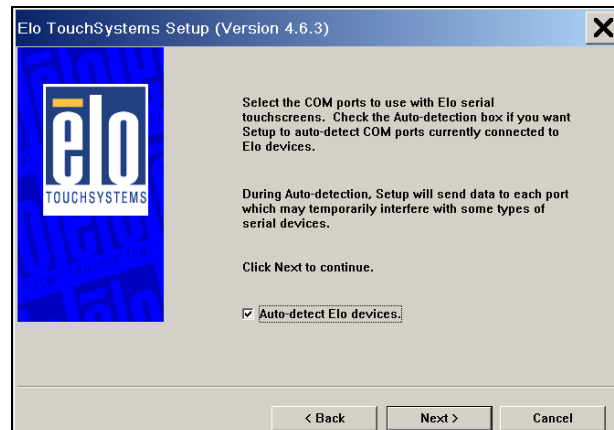
NOTE: After installing the operating software the touch screen(s) should work.

1. Start touch screen driver

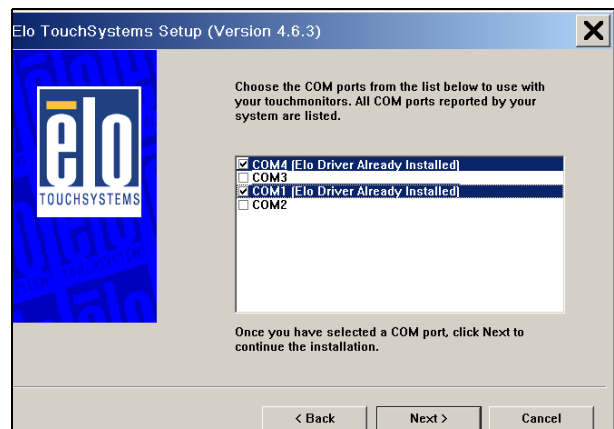
- Open the explorer on the system controller.
 - Select C:\program files\ELOtouchsystems\ELOsetup.exe.
 - Select 'Default'.
 - Select 'next'
-
- Select 'Install serial touch screen driver'.
 - Select 'Next'.
-
- Select 'Next'.



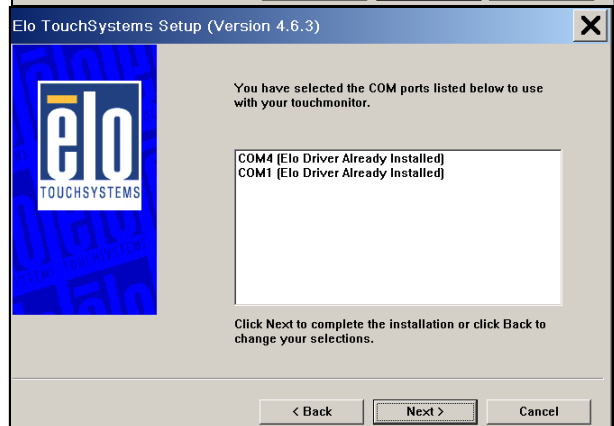
- Select 'Auto-detect ELO Devices'.
- Select 'Next'



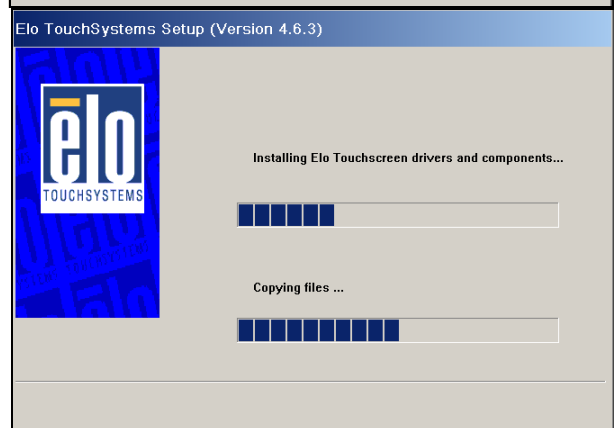
- Select 'COM 1' and 'COM 4'.
- One of both will have the comment '(ELO Driver Already installed)'.
- Select 'Next'.



- Select 'Next'.

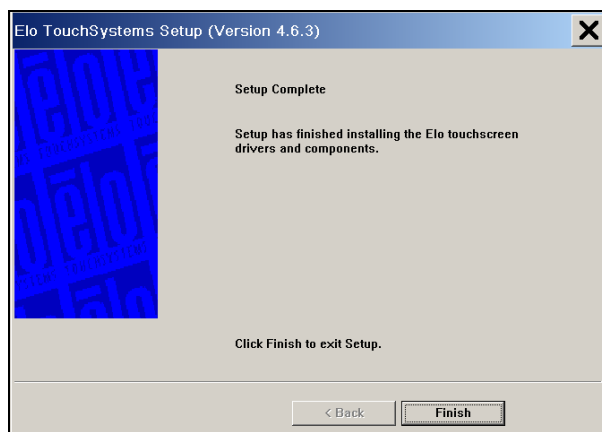


- Wait until the installation is finished



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- Select 'Finish'.
- The installation is finished.



B8.4 Application software and online documentation, installing

Estimated time to complete [min.]: 30
Required special tools. -
Required part(s) -

1. Preparation

- Back up application data, see [B8.5 Application data, back up](#)
- Back up remaining data, see [B8.7 BI, BTCO, SVS Pro, Traceability data, back up and restore](#)

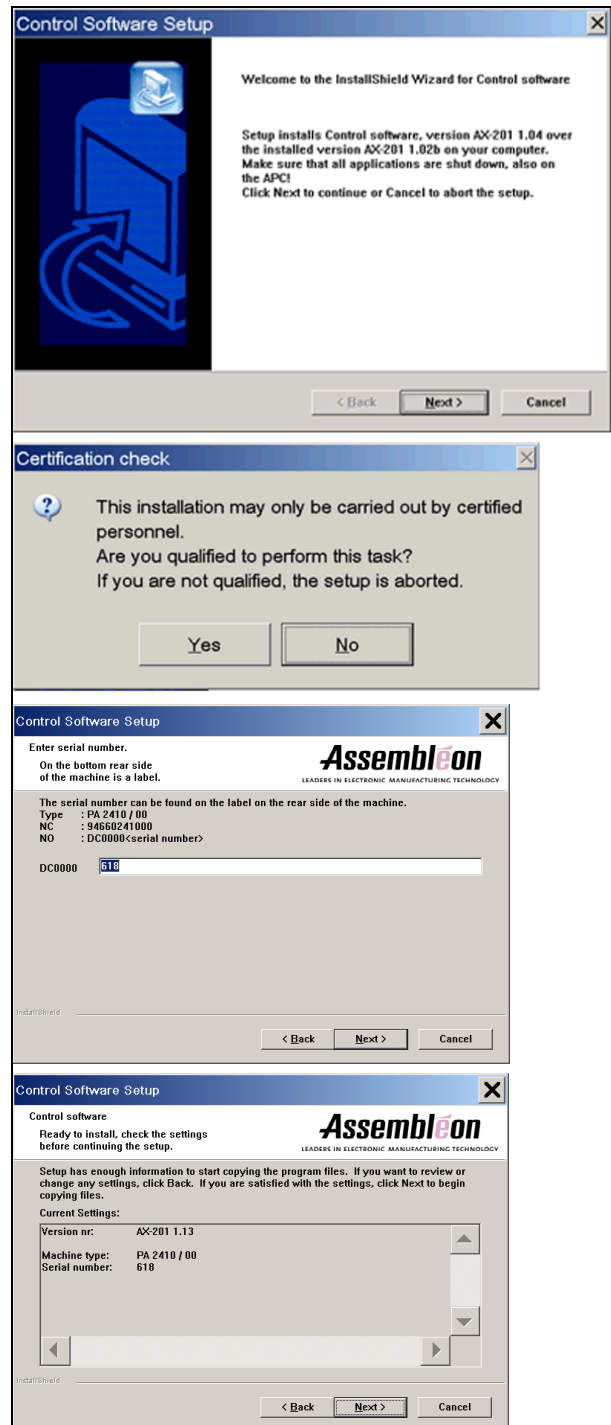
2. Installation

- Insert the CD 'AX-201 Application Software X.XX' in the CD drive of the system controller.
- Start Windows Explorer.
- Select and open 'Setup.exe' in Windows Explorer.
- Select 'Next'.

- Select 'Yes' to continue installation.

- Fill out the DC number of the machine in the DC000 field.
- Select 'Next'.

- Select 'Yes' to continue installation.



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- Select 'Yes' to continue installation.

- Open 'My Computer'.
- Select '<NAME> (E:)'.
• Select 'OK'.

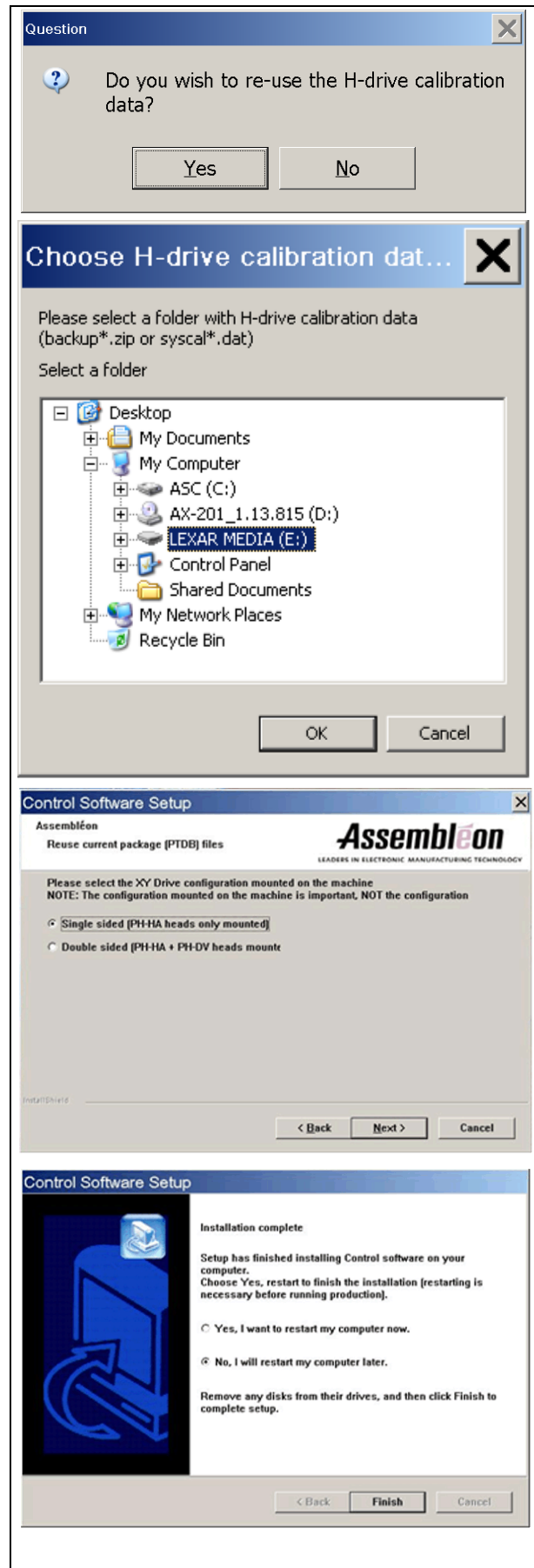
- Select the correct configuration of your machine.
- Select 'Next'.

Note: It **MUST** be the same as it was before.

- Select 'No, I will restart my computer later.' to be able to finish the complete installation.

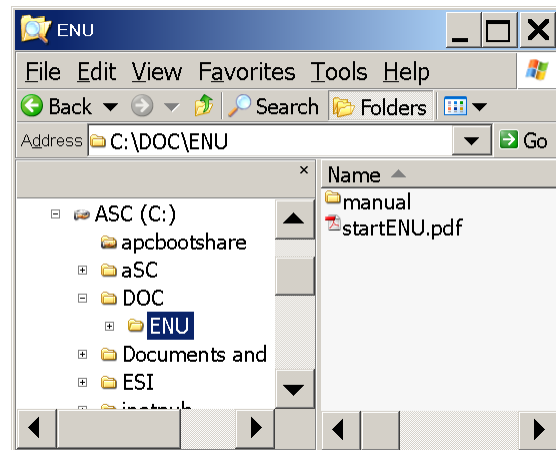
Note: **DO NOT RESTART THE MACHINE AT THIS MOMENT!**

- Select 'Finish'.
- Remove the CD from the CD drive.



3. Install online documentation

- Insert the CD AX-201 Documentation 1.XX' in the CD drive of the system controller.
- Start Windows Explorer.
- Select and open 'Setup.exe' in Windows Explorer.
- Follow the wizard instructions on screen.
- In the last screen select 'Finish'.
- Remove the CD from the CD drive.
- Check if the installation of the online documentation is successful. The DOC folder should have the contents as shown in the picture.



4. Finalize

- Connect to the external network, see [B6.1 External network, connecting](#)
- Restore application data, see [B8.6 Application data, restore](#)
- Restore remaining data, see [B8.7 BI, BTC0, SVS Pro, Traceability data, back up and restore](#)
- For 'right to left' board transport, see [C6.13 Transport direction, changing](#) .
- Set configuration, see [B8.8 Module configuration, setting or adapting](#) .

B8.5 Application data, back up

Estimated time to complete [min.]: 30

Required special tools. -

Required part(s) -



NOTE: Perform this procedure before installing application software.
All placement programs, MIS data and customer specific process data (Fiducial marks, components, bad marks, grippers) must be stored on a network drive or USB stick.

1. Prerequisites

- Stop production.
- Abort all orders.

2. Back up system data

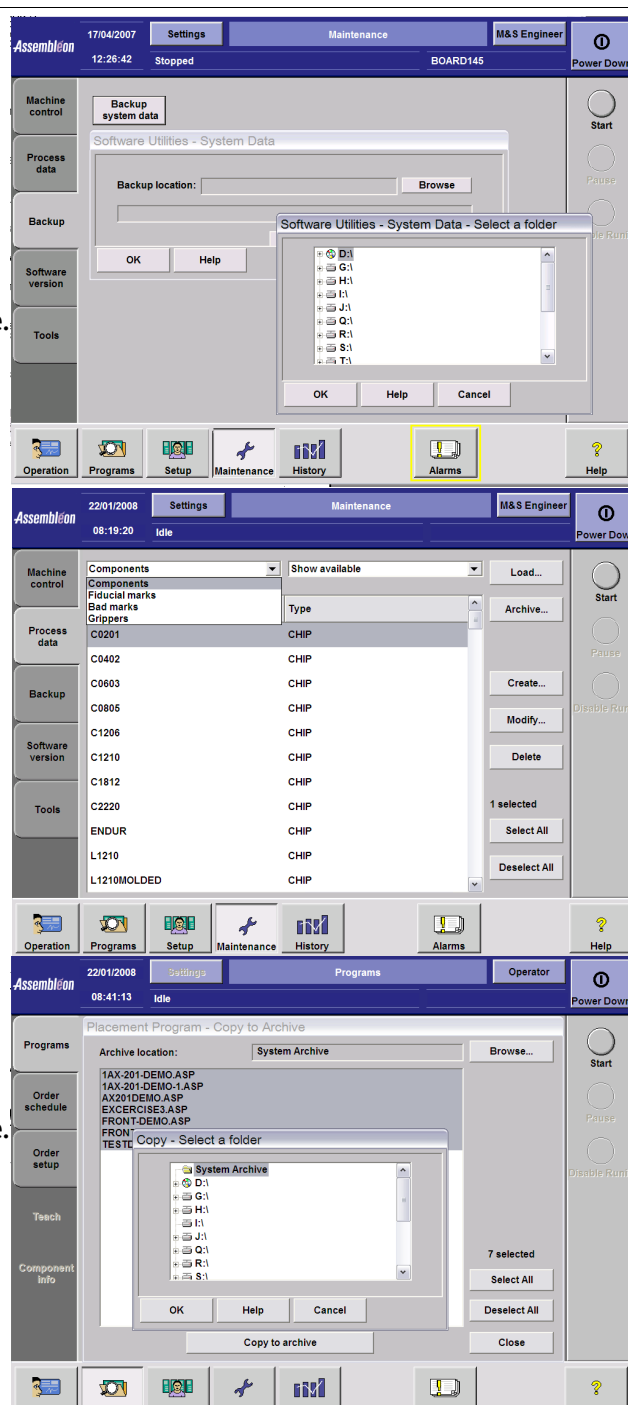
- Log on as M&S engineer.
- Select 'Maintenance', 'Backup', 'Backup system data'.
- Select drive 'E:' (USB stick) or a network drive.
- Select 'OK'.

3. Archive process data

- Change to M&S engineer.
- Select 'Maintenance', 'Process data', '
- Archive all 'Components', 'Fiducial marks' and 'Bad marks' on drive 'E:' (USB stick) or a network drive.

4. Archive placement programs

- Select 'Programs', 'Archive'.
- Select 'Select All'.
- Select 'Browse'.
- Select drive 'E:' (USB stick) or a network drive.



B8.6 Application data, restore

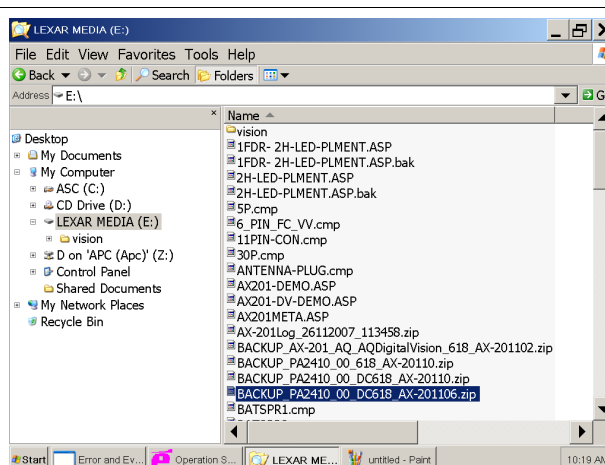
Estimated time to complete [min.]: -
Required special tools. -
Required part(s) -



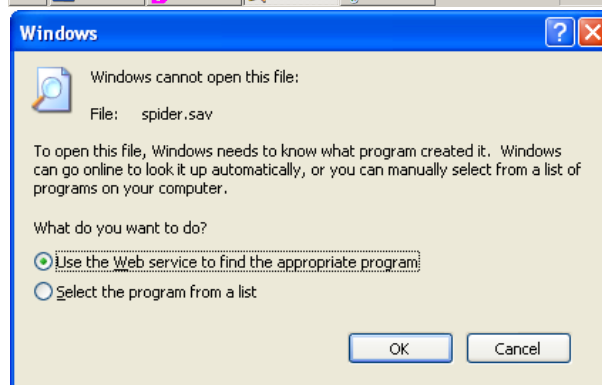
NOTE: Perform this procedure after installing application software.
The placement programs, MIS data and customer specific process data (Fiducial marks, components, bad marks, grippers) must be restored from a network drive or USB stick.

1. General

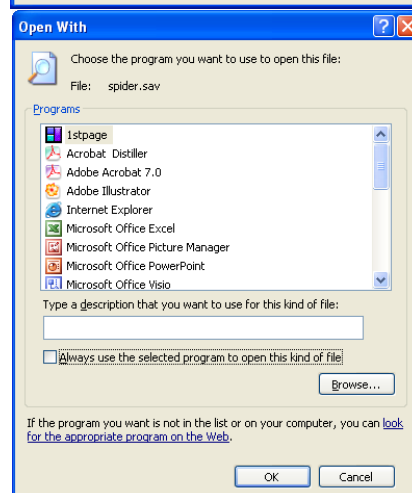
- Log on as M&S engineer.
- Open 'Windows Explorer'.
- Select drive 'E:' (USB stick) or a network drive.
- Double click on the last made backup *.ZIP file and double click.



- Select 'Select a program from a list'.
- Select 'OK'.



- Select 'Browse'.



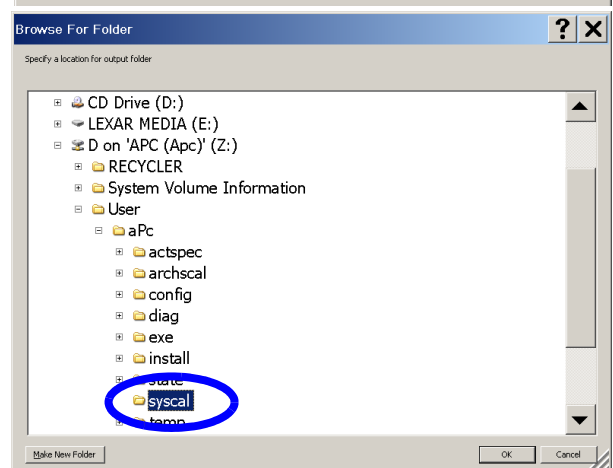
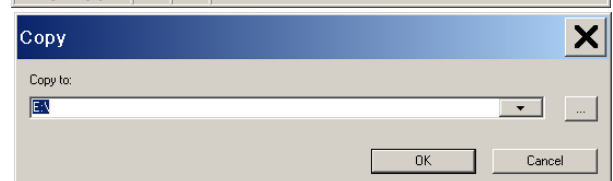
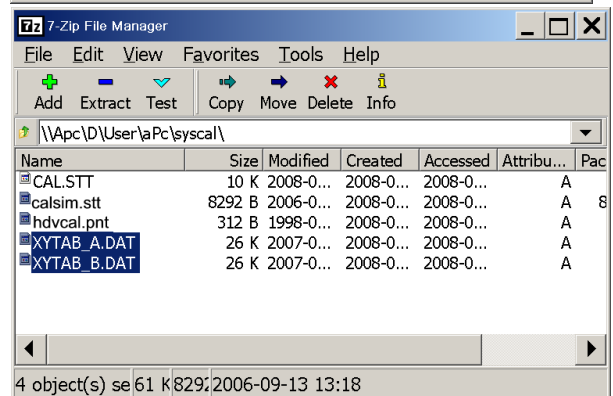
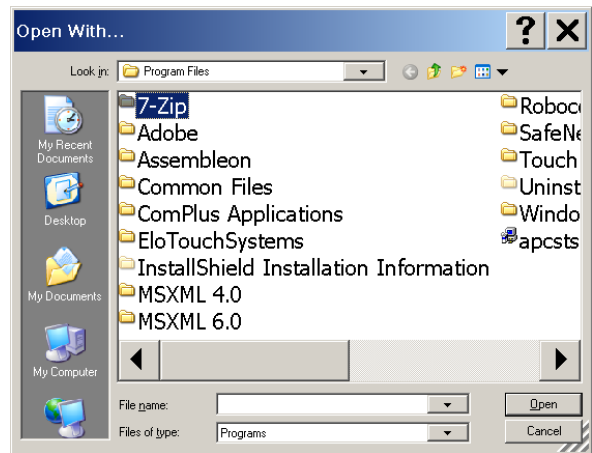
B8-00020.fm

2. Select compressed back up file

- Select the folder 7-Zip
- Select 'Open'.
- Select '7zipFM.exe' in the next screen.
- Select 'OK'.

3. Extract back up files

- Browse in the 7-zip file manager to user/apc/syscal/...
- Select the files **XYTAB_A.DAT** and **XYTAB_B.DAT**
- Select 'Extract'.
- Select the browse button.
- Browse to the same location on the process controller; 'D on APC/user/apc/syscal/..'
- Extract the selected files to the new location.
- Select 'OK'.
- Select 'OK'.



- Browse in the 7-zip File manager window to; user/apc/config/fdr/..
- Select all **customer specific feeder files**.
- Extract the files to the same location on the process controller;
D on APC/user/apc/config/fdr/..

Note: Never select and copy any files with a '!' in front.

- Browse in the 7-zip File manager window to; user/apc/config/Toolbits/
- Select all **customer specific toolbit files**.
- Extract the files to the same location on the process controller; 'D on APC/user/apc/config/Toolbits/'

Note: Do **not** overwrite the existing toolbit files. The syntax has changed.

- Open the special **grripper files** and change the two highs as described in the special gripper manual.

Note: Never select and copy any files with a '!' in front.

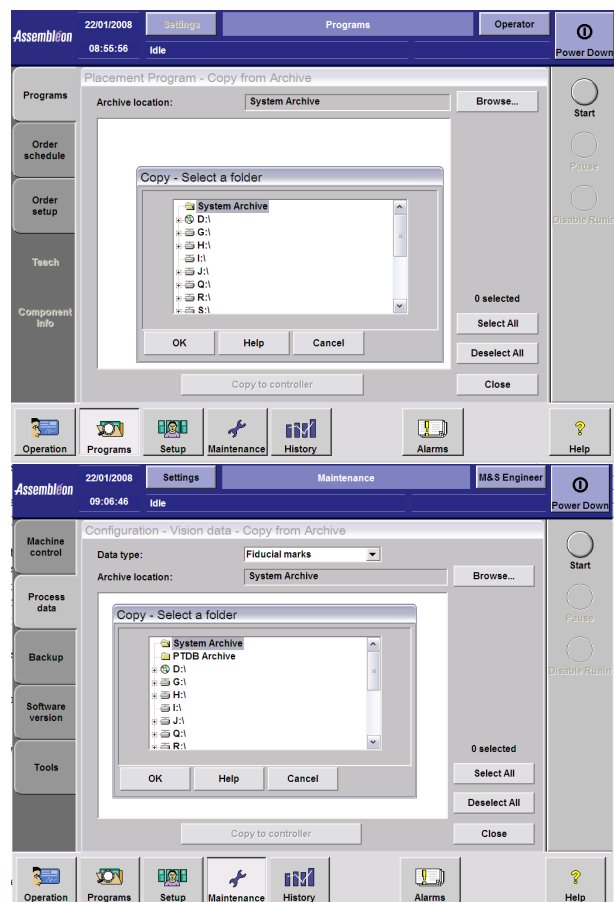
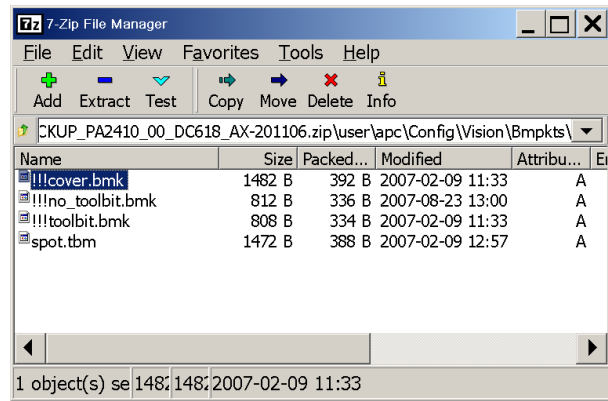
4. Restore placement programs

- Start up application software.
- Select 'Programs', 'Load'.
- Select 'Browse', select drive 'E:' (USB stick) or a network drive.
- Select 'All'.
- Select 'Copy to controller'.

5. Restore process data

- Logon as M&S engineer.
- Select 'Maintenance'.
- Select 'Process data'.
- Restore 'Components', 'Fiducial marks' and 'Bad marks' from drive 'E:' (USB stick) or a network drive.

Note: Do not overwrite the existing toolbit files. The syntax has changed.



B8.7 BI, BTCO, SVS Pro, Traceability data, back up and restore

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1. Back up and restore BI and BTCO data

- Open the 'Windows Explorer'
- Go to C: \aSC\Config and select the 'BI.cfg' file and the 'MPMMAT.sav' file.
- Safe the files on 'E' (USB Stick) or a NETWORK drive.
- Go to C: \aSC\BI\DATA and select the 'DATA' directory.
- Safe the directory on 'E' (USB Stick) or a NETWORK drive.

After installation;

- Copy from the backup the two files and safe the files in C: \aSC\Config.
- Copy from the backup the DATA directory and safe the directory in C: \aSC\BI. Create the BI folder if applicable.

2. Back up and restore SVS Pro data

Note: See SVS Pro 4.20 manual, software part.

- Open the 'Windows Explorer'
- Go to C: \aSC\CIM and select the 'DATA' and 'SETUP' directory's.
- Safe the directory's on 'E' (USB Stick) or a NETWORK drive.

After installation;

- Copy from the backup the two directory's and safe the directory's in C: \aSC\CIM. Create the CIM directory if applicable.

3. Back up and restore TRACEABILITY data

Note: See the traceability manual for instructions.

Have the Traceability installation CD available.

- Open the 'Windows Explorer'
- Go to C: \aSC\EMAN\Web\EMAN\SD and select all files.
- Safe the files on 'E' (USB Stick) or a NETWORK drive.

After installation;

- First install Traceability according to the installation procedure in the manual (On the CD)
- Copy from the backup the files and safe the files in directory's in C: \aSC\EMAN\Web\EMAN\SD.

B8.8 Module configuration, setting or adapting

Changing the configuration is performed in two situations:

- After installation or upgrading the application software the machine will have no module configuration, It must be set again, see [B8.8.1 Module configuration, setting](#)
- When adding or changing a camera, trolley or fluxer, the update of the setup is not automated, and must be adapted, see [B8.8.2 Module configuration, adapting](#)

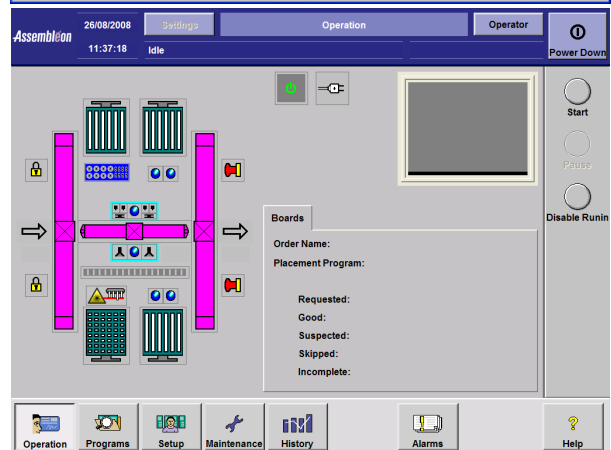
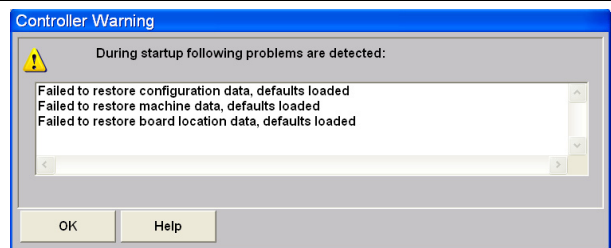
B8.8.1 Module configuration, setting

1. Start up the machine

The following screen will appear.

- Click on 'OK' to remove the warning.

The following screen will appear.

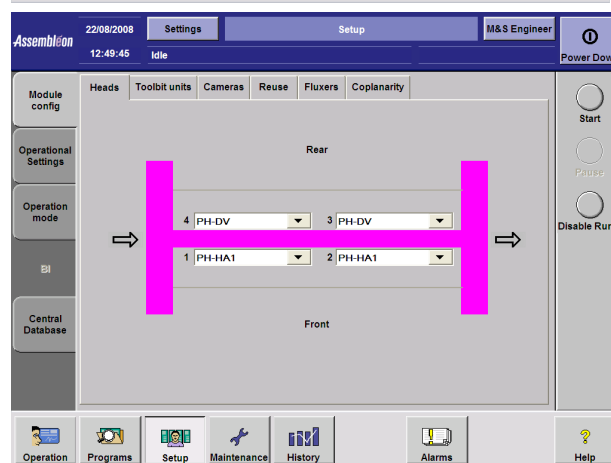


2. Select module configuration

- Log in as M&S engineer.
- Select 'Setup'
- Select 'Module config'

The following screen will appear.

All changes will be effective immediately.



B8-00021.fm

3. Configure heads

- Select the 'Heads' tab.
- The following screen will appear.
- Select for each placement head slot the applicable placement head.

4. Configure toolbit units

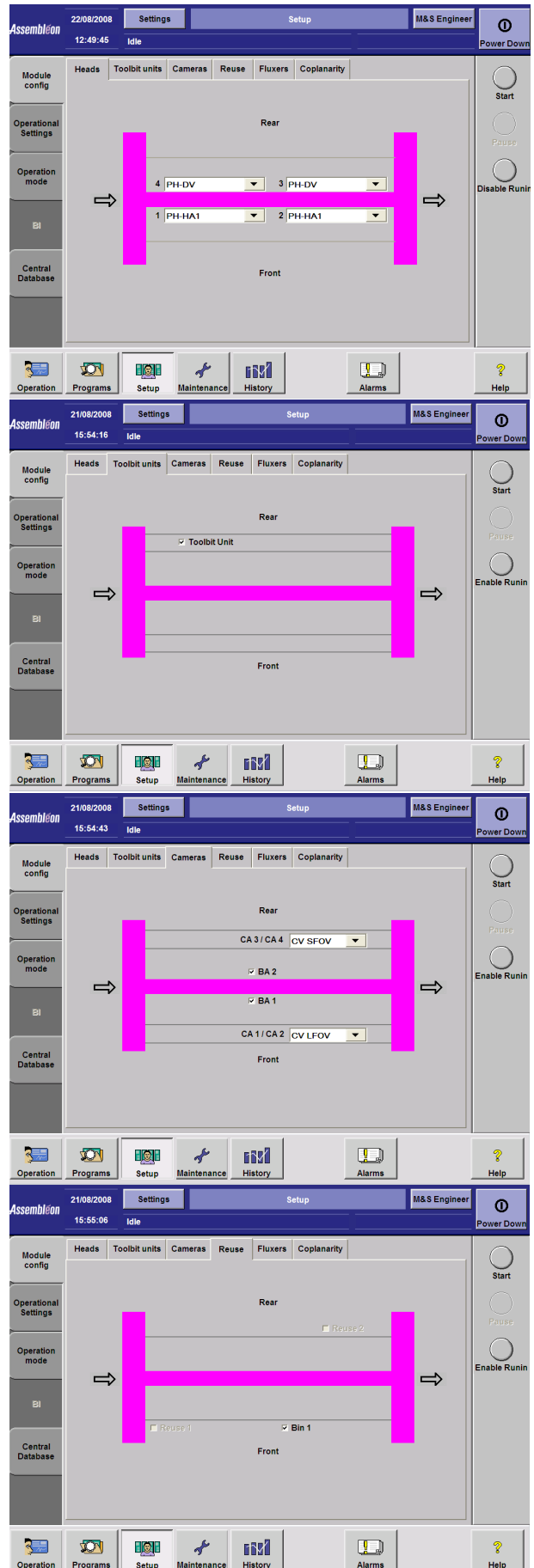
- Select the 'Toolbit Units' tab.
- The following screen will appear.
- Select the rear toolbit unit.

5. Configure cameras

- Select the 'Cameras' tab.
- The following screen will appear.
- Select 'Front', 'BA 1' camera.
 - Select the applicable other camera's for each camera position.

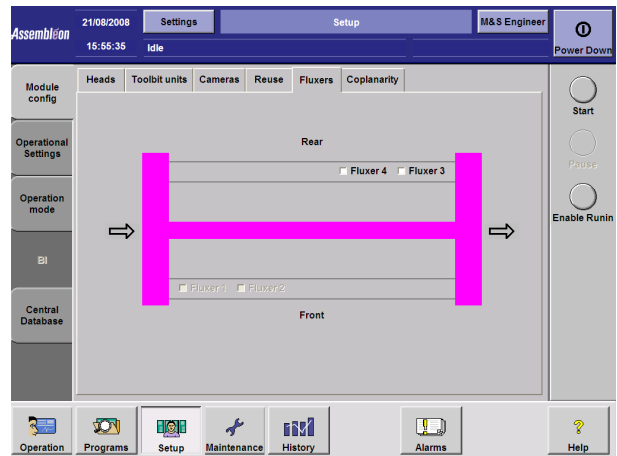
6. Configure reuse station

- Select the 'Reuse' tab.
- The following screen will appear.
- Select 'Bin 1' at the front.
 - Select if applicable 'Reuse 1' at the front.



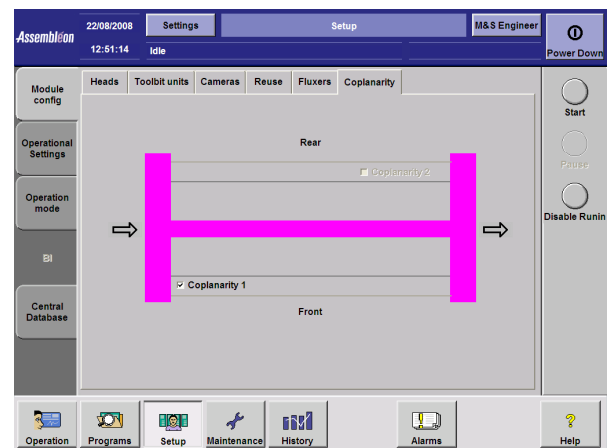
7. Configure fluxer

- Select the 'Fluxers' tab.
- The following screen will appear.
- Select the applicable fluxers.



8. Configure coplanarity

- Select the 'coplanarity' tab.
- The following screen will appear.

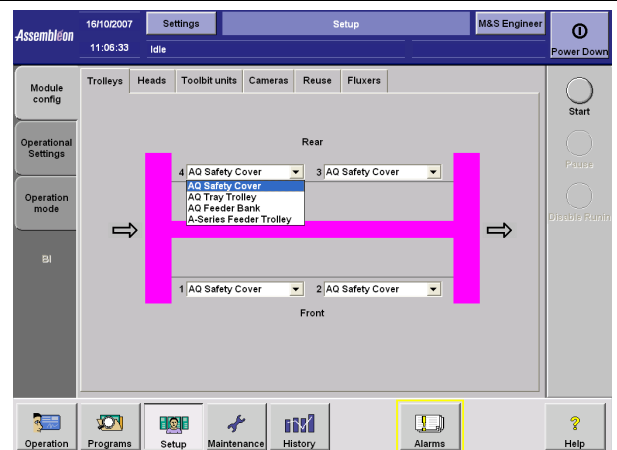


B8.8.2 Module configuration, adapting

1. Adapt the module configuration

- Log in as M&S engineer.
- Stop production.
- Abort the running order.
- Select 'Setup'.
- Select 'Module Config'.
- Select the applicable tab (see B8.8.1 for all possible screens).
- Make the change.

The change will be effective immediately.



B8.9 Boards in controllers, replacement

Estimated time to complete [min.]:
Required special tools.
Required part(s) [A8.4.1 Controllers, spares](#)

1. Repair policy

- System, process and SVS Pro controllers.
These controllers can only be replaced as a whole module.
Defective modules need to be returned to Assembléon for investment
After one year the need of spare parts in this module will be defined.

B8-00018.fm

B8.10 Software licence hardware key, replacement

Estimated time to complete [min.]: 10
Required special tools. -
Required part(s) [A8.4.4 Base, spares](#)

1. General

- Because the software licence hardware key is specifically programmed for each licence combination, communication with Assembléon is an important part of this procedure.
- This procedure is only applicable when replacing a defective software licence hardware key.

For updating the software licences (adding more licences) refer to [A4.3.7.3 Hardware keys](#) and [A6.3 Software licences, adjusting](#) . This procedure can be done while the machine is in idle state or powered down.

2. Replace the software licence hardware key

- Remove front trolley at the right.
- Open hood.
- Replace key located behind the cable duct at the right side of the machine

3. Key handling

- Send the defective hardware key back to Assembléon using the customized repair channel service number, together with this information for the regional service centre:
 - * Customer name
 - * address
 - * telephone number
 - * e-mail address
 - * PA- and DC-number of the machine
 - * The required licenses combination.

If it is necessary to bridge the time until the specifically programmed software license hardware key arrives, order the hardware key (300 hrs), see [A8.4.4 Base, spares](#) .

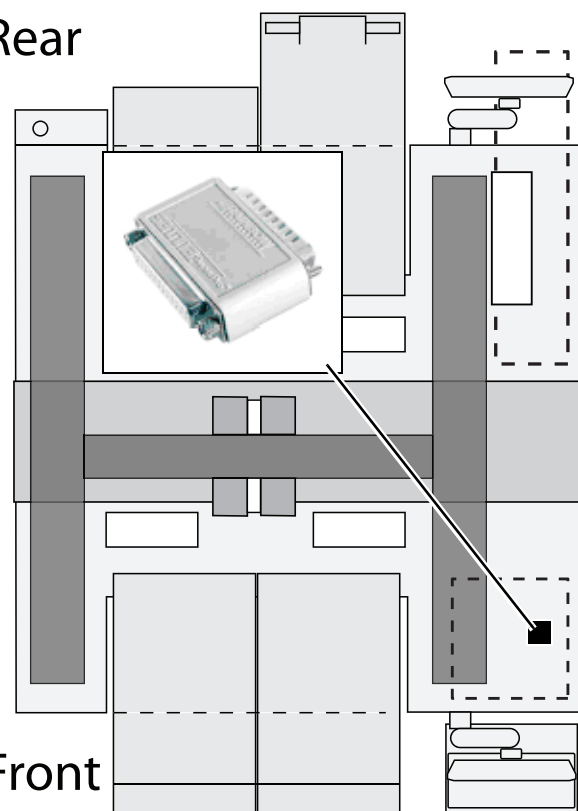
Place the software licence hardware key with limited validity on the machine.

The specifically programmed software license hardware key arrives.

Place the specifically programmed software license hardware key on the machine. The software licence hardware key with limited validity can be discarded.

Rear

Front



B8.11 Control supply components, replacement

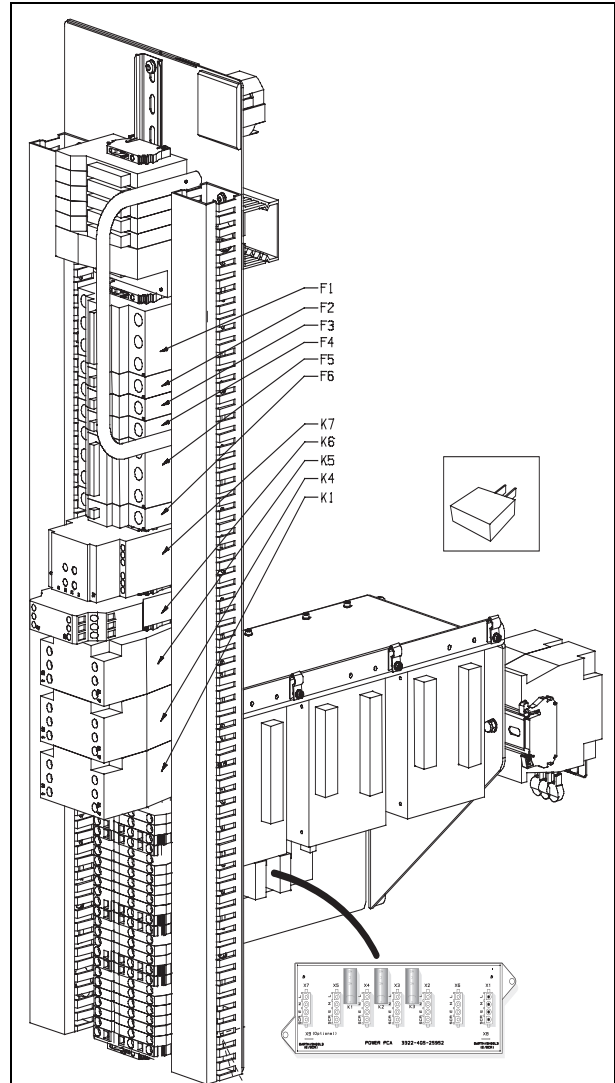
Estimated time to complete [min.]:	15
Required special tools:	-
Required part(s)	A8.4.2 Control supply, spares

1. Prerequisites

- Power down the machine.

2. General replacement procedures

- Location of components, see [B5.3.9 Mains supply PA 2410/00, features](#)
- Most components in the control supply unit are mounted on rails.
- Remove the components by pressing the release button.
- They can be mounted by pressing them on the rails.
- Label the new component as the old one.
- When replacing adjustable components, make sure they are adjusted correctly:
 - * [B5.3.9.1 Phase guard relay \(K7\), features](#)
 - * [B8.21 Power supply units 22-24V, replacement](#)



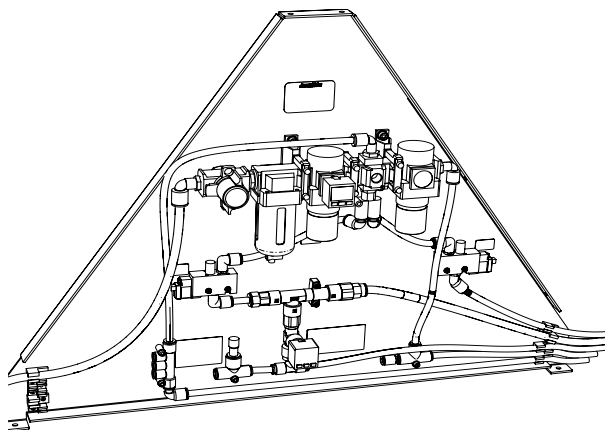
B8-00007.fm

B8.12 Air supply unit, replacement

Estimated time to complete [min.]: -
Required special tools. -
Required part(s) [A8.4.5 Air supply unit, spares](#)

1. Replacement of parts

- To be defined.



B8-00008.fm

B8.13 Mains switch, replacement

Estimated time to complete [min.]: 30

Required special tools. -

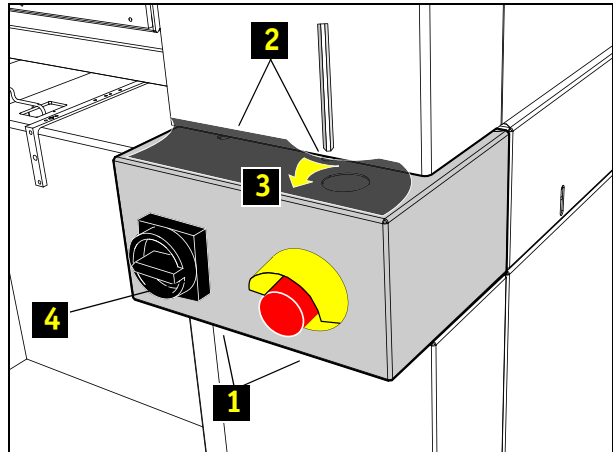
Required part(s) A8.4.4 Base, spares

1. Prerequisites

- Ensure that the mains supply to the system is inactive by removing the relevant factory fuses.

2. Removing the panel, rear

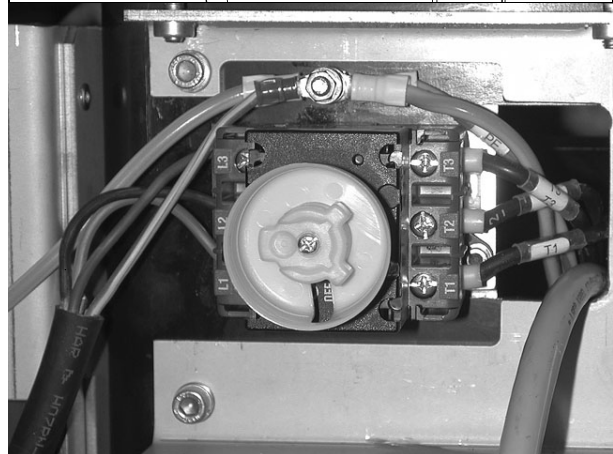
- Remove the two bolts (1) from underneath.
- Loosen the two bolts (2) on top, turn over the cover (3),
- Turn the mains switch (4) in the 'OFF' position and put the cover aside.



3. Replace the mains switch

- Replace the mains switch.
- Connect the cables, tightening torque 1.2 - 1.6 Nm

Cable	Power supply
Ground	ground screw
Phase 1	X1.L1
Phase 2	X1.L2
Phase 3	X1.L3



4. Finalize

- Install the mains switch cover.
- Install the factory fuses.

B8-00017.fm

B8.14 Touch screen, replacement

Estimated time to complete [min.]: 20

Required special tools. -

Required part(s) A8.4.4 Base, spares

1. Prerequisites

- Power down the machine.

2. Removal

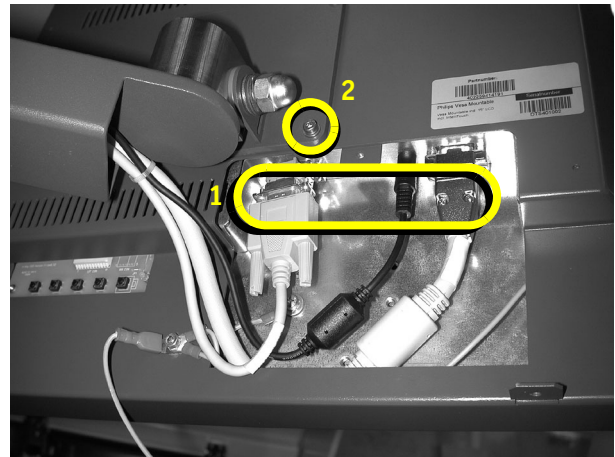
- Remove the back plate from the monitor.
- Remove the connections (1)
- Remove the screen by loosening the 4 bolts (2)

3. Installation

- Installation is in reverse order.

4. Calibrating the touch screen

- See [B6.2 Touch screen, calibrating](#) .



B8.15 Trolley lift, replacement

B8.15.1 Trolley lift on AX-201, replacement

B8.15.1.1 Trolley lift, replacement



HEAVY OBJECT

Improper lifting method may cause injury.
Use proper tools to lift the object.

Weight:

25 kg

1. Prerequisites

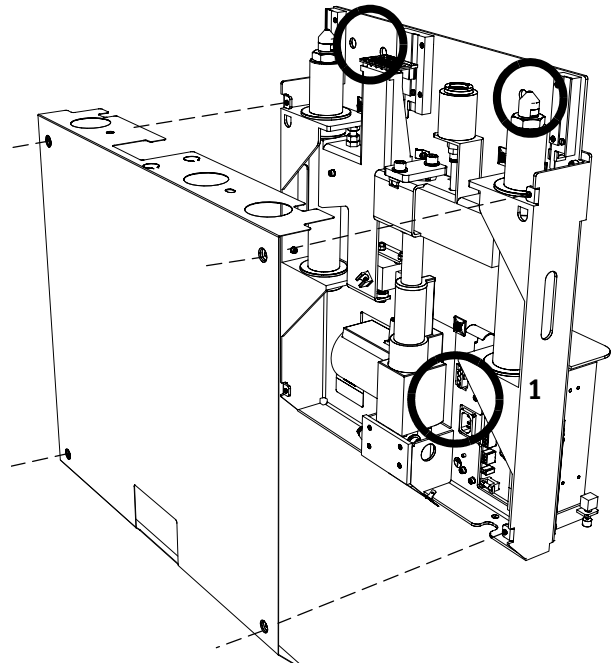
- Remove the trolley lift front plate (4 screws, 1 ground connection).

2. Removal

- Disconnect the power supply cable and the safety circuit cable (1).
- Remove the trolley lift (2 x 4 Allen bolts), use two persons to lift it.

3. Installation

- Installation is in reverse order.



B8.15.1.2 Trolley lift, swing cross beam



HEAVY OBJECT

Improper lifting method may cause injury.
Use proper tools to lift the object.

Weight:

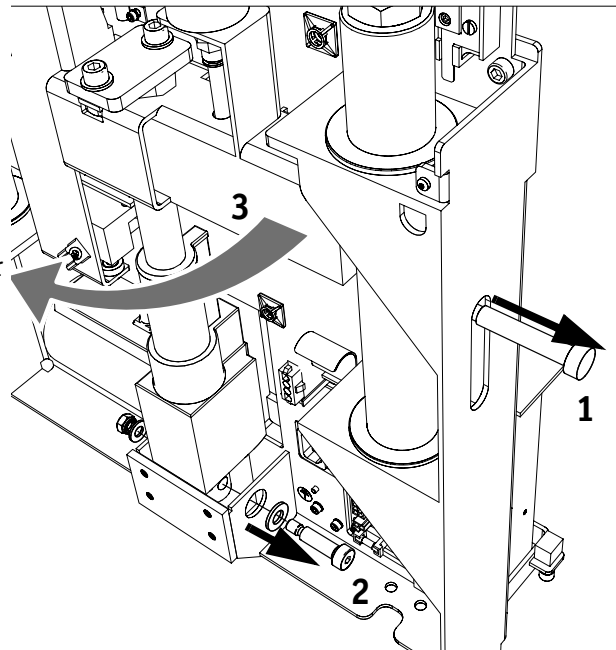
25 kg

1. Prerequisites

- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement](#)

2. Removal

- Place the trolley lift flat on its back, use 2 persons to lift it.
- Remove the Allen bolt (1) that connects the cross beam to the right cylinder.
- Remove the Allen bolt (2) on the bottom of the actuator (wiggle the actuator).
- Disconnect the flat cable from the lift controller board.
- Loosen the security that keeps the flat cable in place.
- Shift the cross beam upward.
- Swing the cross beam away (3) from the trolley lift frame.



3. Installation

- Installation is in reverse order.

B8.15.1.3 Hose on trolley lift, replacement

1. Prerequisites

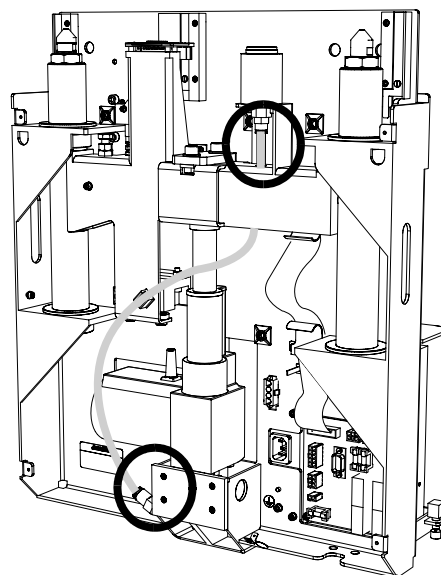
- Remove the trolley lift front plate (4 screws, 1 ground connection).

2. Removal

- Disconnect the hose on both sides.

3. Installation

- Installation is in reverse order.



B8-00005.fm

B8.15.1.4 Micro switch on trolley lift, replacement

1. Prerequisites

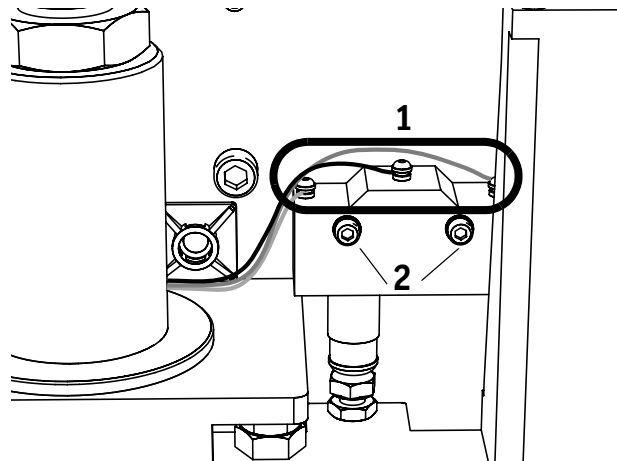
- Remove the trolley lift front plate (4 screws, 1 ground connection).

2. Removal

- Remove the two Allen bolts (2).
- Disconnect all cables (1) (3 screws) from the micro switch.

3. Installation

- Installation is in reverse order.



B8.15.1.5 Base interface board on trolley lift, replacement

1. Prerequisites

- Remove the trolley lift front plate (4 screws, 1 ground connection).

2. Removal

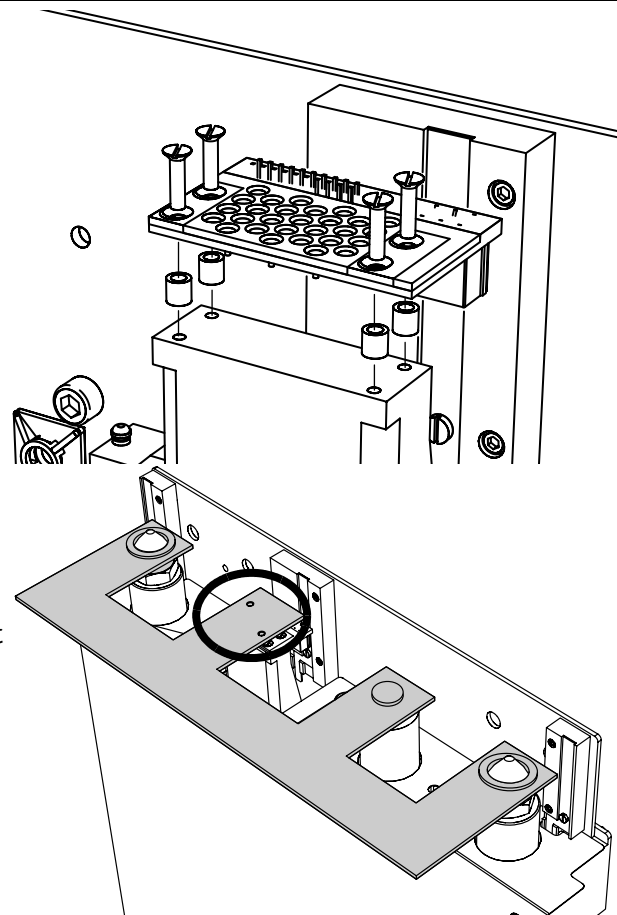
- Remove the base interface board (4 screws).

Note: Be careful not to lose the distance bushes.

- Disconnect all connectors from the base interface board.

3. Installation

- Installation is in reverse order.
- Adjust base interface board using 9498-396-00118.
- Look through both holes to check if the contact pins on the base interface board are complete visible.



B8.15.1.6 Flat cable on trolley lift, replacement

1. Prerequisites

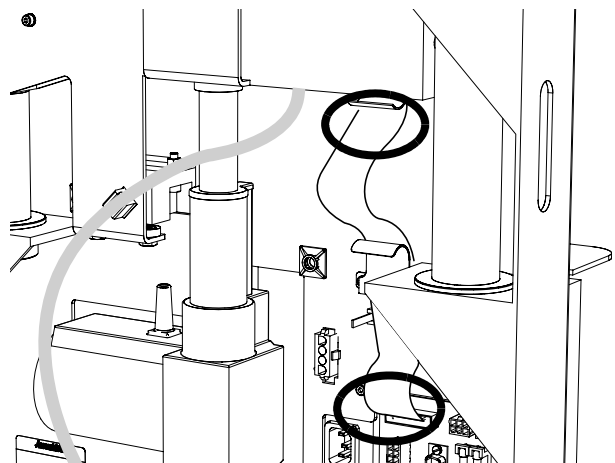
- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement](#)
- Swing the cross beam away from the trolley lift frame, see [B8.15.1.2. Trolley lift, swing cross beam](#).

2. Removal

- Loosen all securities that keep the flat cable in place.
- Disconnect the flat cable on both sides.

3. Installation

- Installation is in reverse order.



B8.15.1.7 Actuator on trolley lift, replacement

1. Prerequisites

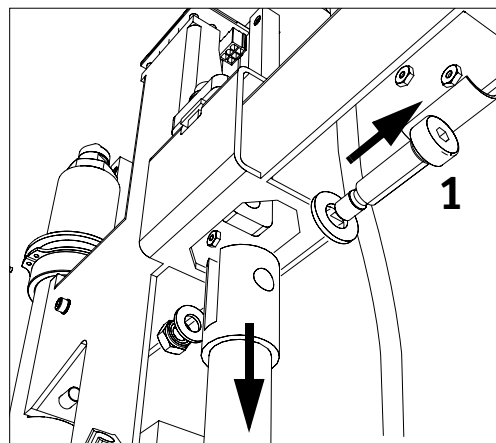
- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement](#).
- Swing the cross beam away from the trolley lift frame, see [B8.15.1.2. Trolley lift, swing cross beam](#).

2. Removal

- Remove the tie-wrap keeping the actuator cable in place.
- Disconnect the actuator cable from the lift controller board.
- Remove the Allen bolt (1) at the top of the actuator.
- Remove the actuator.

3. Installation

- Installation is in reverse order.



B8.15.1.8 Power cable on trolley lift, replacement

1. Prerequisites

- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement.](#)
- Swing the cross beam away from the trolley lift frame, see [B8.15.1.2. Trolley lift, swing cross beam.](#)

2. Removal

- Remove the tie-wrap keeping the cable in place.
- Disconnect the power cable on both sides.

3. Installation

- Installation is in reverse order.

B8.15.1.9 Power supply 24V on trolley lift, replacement

1. Prerequisites

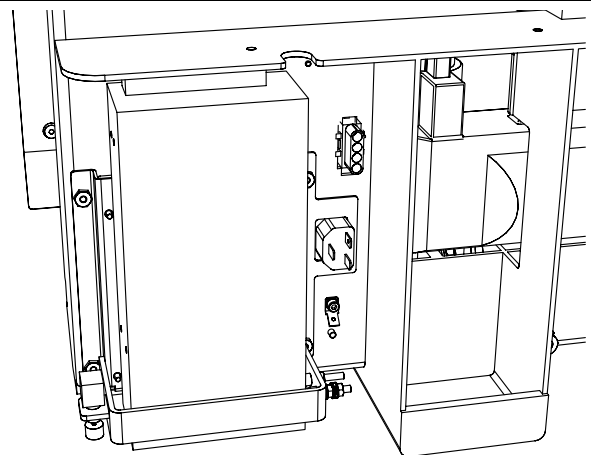
- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement.](#)

2. Removal

- Place the trolley lift facing up, use 2 persons to lift it.
- Remove the power supply 24 V (4 Allen bolts).

3. Installation

- Installation is in reverse order.



B8.15.1.10 Trolley lift controller, replacement

1. Prerequisites

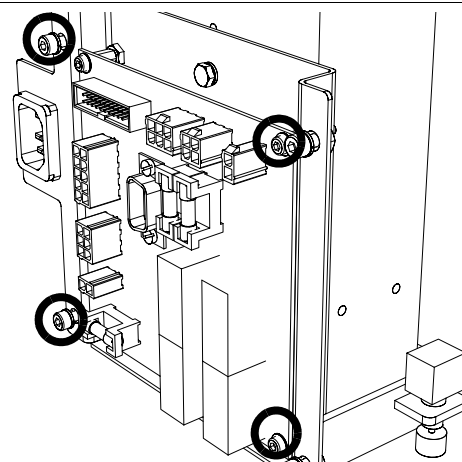
- Remove the trolley lift front plate (4 screws, 1 ground connection).

2. Removal

- Disconnect all (8) cables.
- Remove the lift controller board (4 Allen bolts).

3. Installation

- Installation is in reverse order.



B8.15.1.11 Switch on trolley lift, replacement

1. Prerequisites

- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement](#).

2. Removal

- Place the trolley lift on its back.
- Remove the applicable cable from the trolley lift controller.
- Remove the switch from the trolley lift

3. Installation

- Installation is in reverse order.

B8.15.1.12 Safety interlock on trolley lift, replacement

1. Prerequisites

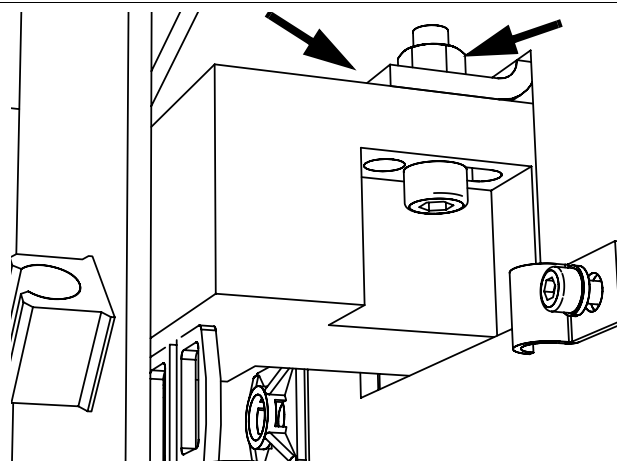
- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement](#)
- Swing the cross beam away from the trolley lift frame, see [B8.15.1.2. Trolley lift, swing cross beam](#).

2. Removal

- Remove safety interlock (2 Allen bolts and cable).

3. Installation

- Installation is in reverse order.
- Test the correct function of the safety interlock (when the trolley lift is in the upper position, the safety circuit must be closed).



B8.15.1.13 Safety interlock actuator on trolley lift, replacement

1. Prerequisites

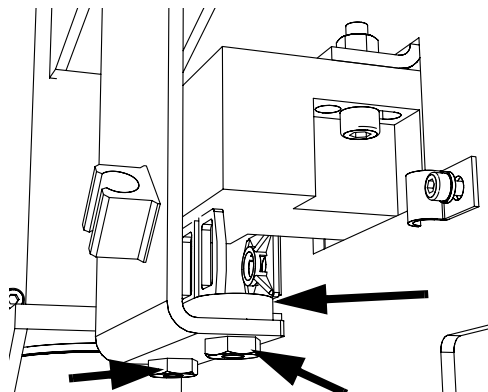
- Remove the trolley lift, see [B8.15.1.1. Trolley lift, replacement](#).
- Swing the cross beam away from the trolley lift frame [B8.15.1.2. Trolley lift, swing cross beam](#).

2. Removal

- Remove safety interlock actuator (2 torx screws).

3. Installation

- Installation is in reverse order.
- Test the correct function of the safety interlock (when the trolley lift is in the upper position, the safety circuit must be closed).



B8.15.1.14 Glass fuse 5mmx20mm slow blow 4A on trolley lift, replacement

1. Prerequisites

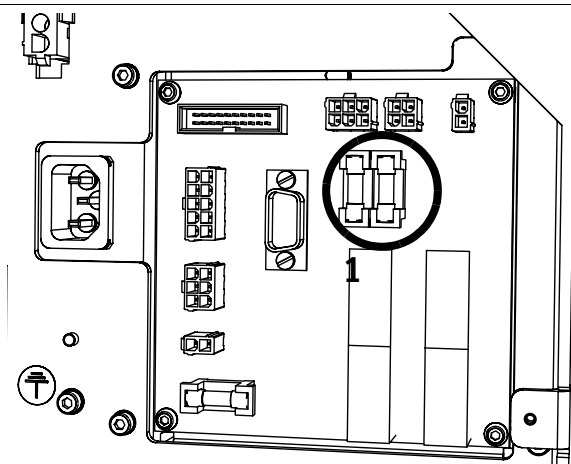
- Remove the trolley lift front plate (4 screws, 1 ground connection).

2. Removal

- Remove the fuse (1).

3. Installation

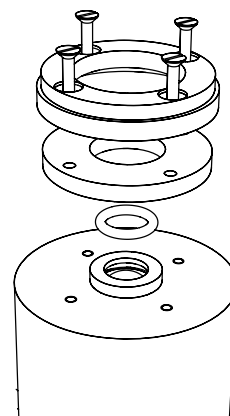
- Installation is in reverse order.



B8.15.1.15 Rubber ring on trolley lift, replacement

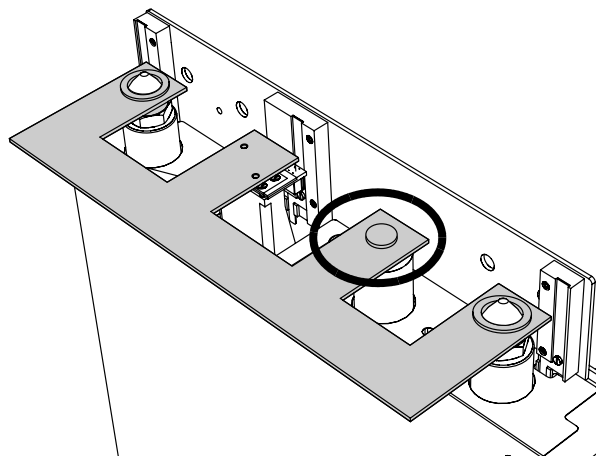
1. Removal

- Remove 4 screws from the air connection.
- Remove the rubber ring.



2. Installation

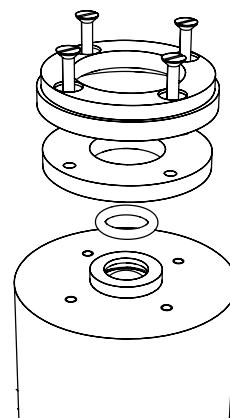
- Installation is in reverse order.
- Adjust air connection using 9498-396-00118.
- At the bottom there is a ring that falls in the air connector.



B8.15.1.160-ring 7.65x1.78 on trolley lift, replacement

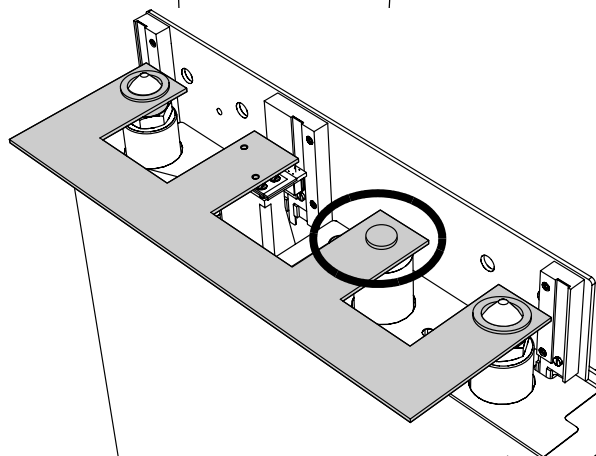
1. Removal

- Remove 4 screws from the air connection
- Remove the O ring.



2. Installation

- Installation is in reverse order.
- Adjust air connection using 9498-396-00118.
- At the bottom there is a ring that falls in the air connector.



B8-00005.fm

B8.16 Gas spring on front and rear hood, replacement

Estimated time to complete [min.]: -

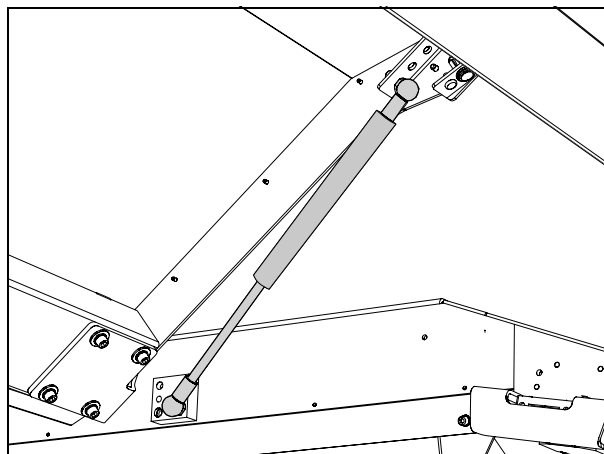
Required special tools. -

Required part(s) [A8.4.4 Base, spares](#)

1. Replacing the gas spring

- Open concerning hood.
- Loosen gas spring on both ends.
- Hold hood when replacing gas spring.
- Place new gas spring.

Note: Mount gas spring upside down to avoid leakage.



B8-00010.fm

B8.17 Safety interlocks on front and rear hood, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s) A8.4.4 Base, spares

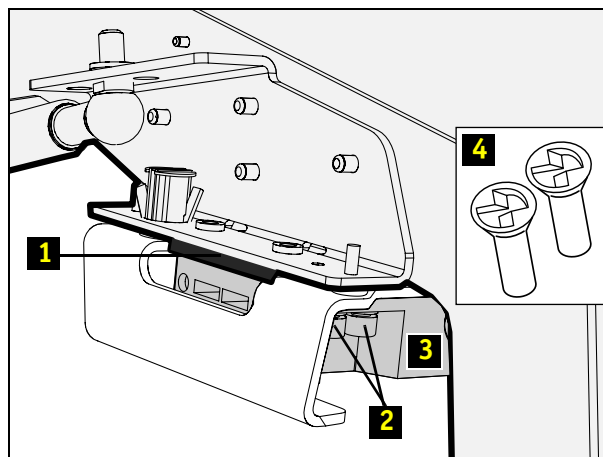
1. Prerequisites

- Power down the machine.
- Remove trolleys.

2. Replace actuator key

Note: For safety reasons the actuator key and the safety interlock are coded. They can only be replaced as pair.

- Open the cover and drill out the one way screws (4) on actuator key (1) and take it out.
- Remove the old screws.
- Place the new actuator key (1) and tighten with new one way screws (4).



3. Replace safety interlock

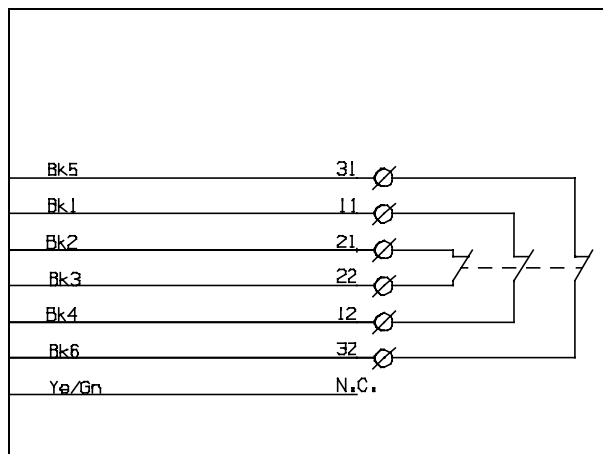
Note: The safety interlock is supplied without cabling.

Note: Note the position of the connections.

- Remove safety interlock from cable.
- Mount new safety interlock.

4. Finalize

- Power up the machine.
- Check that the safety interlock interrupts the safety circuit when the cover is lifted less than 20 mm.
- Use the mounting bolts (2) for adjustment.



B8.18 Lamp post, indicators and buzzer replacement

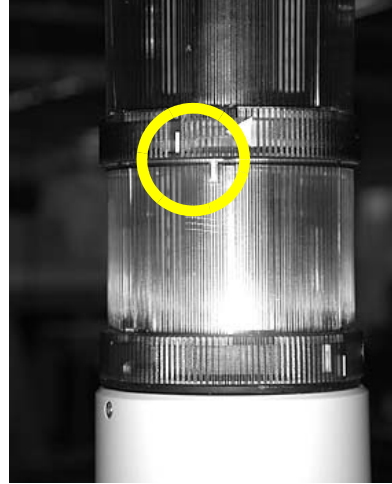
Estimated time to complete [min.]:

Required special tools.

Required part(s) [A8.4.4 Base, spares](#)

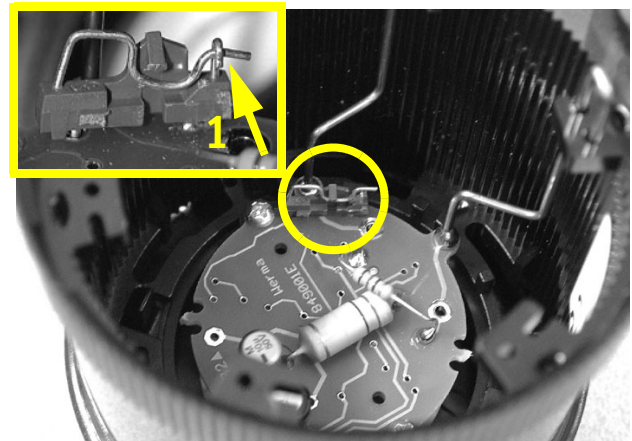
1. Replacement of indicators and buzzer

- Turn the segment until the markers are facing each other.
- Lift up the segment.



2. Install indicators and buzzer

- Buzzer: Close the switch, see picture (1).
- Position the segment on top of the other segments, with the markers facing each other.
- Turn the segment.



B8.19 Interconnection board base, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s) [A8.4.4 Base, spares](#)

1. Preparation

- Remove the front right trolley.
- Power down the machine.
- Open the front door of the machine.

2. Remove panel

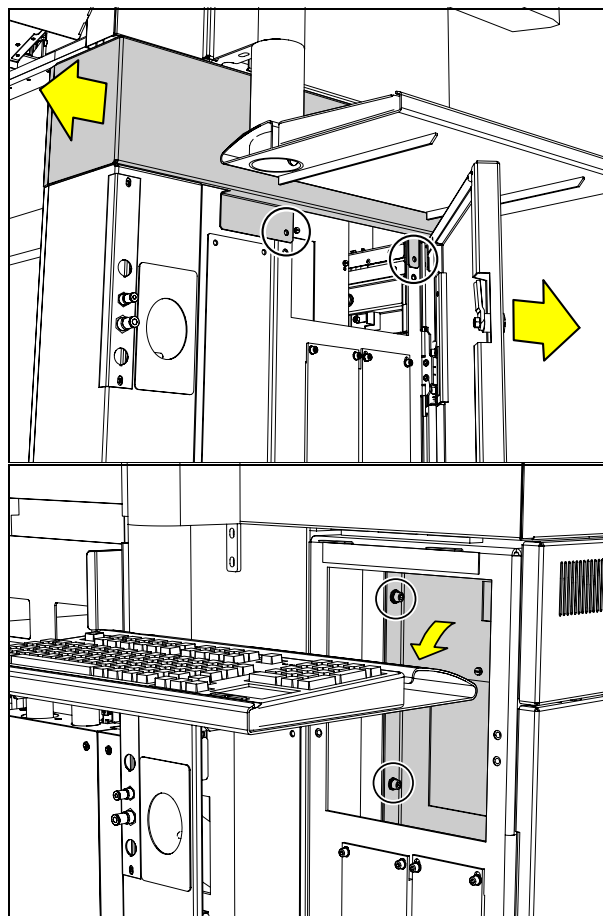
- Remove the two bolts.
- Slide out the panel.
- Disconnect the connectors.

3. Replace the interconnection board on base

- Remove the bolts.
- Turn the bracket and remove all connectors.
- Take bracket with board out.
- Transfer bracket to new board.
- Installation in reverse order.

4. Finalize

- Start up the machine.
- Check LED status, see [B5.3.11 Interconnection board base, fuses and LED signalling](#)
- Close the front door of the machine.



B8-00012.fm

B8.20 Interconnection board electrics, replacement

Estimated time to complete [min.]: -
Required special tools: -
Required part(s) [A8.4.2 Control supply, spares](#)

1. Preparation

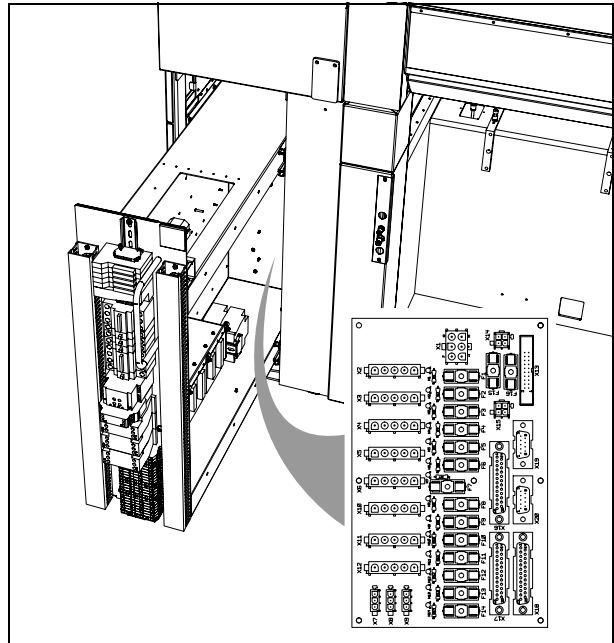
- Power down the machine.
- Open the rear cover of control supply unit.
- Pull out the control supply unit.

2. Replace the interconnection board on base

- Remove all connectors.
- Loosen board from bracket.
- Place new board.
- Place connectors.

3. Finalize

- Start up the machine.
- Check LED status, see [B5.3.16 Interconnection board electrics, signals](#)
- Close front cover of control supply unit.



B8.21 Power supply units 22-24V, replacement

Estimated time to complete [min.]: -
 Required special tools: Multi meter
 Required part(s) A8.4.2 Control supply, spares

1. Prerequisites

- Power down the machine.
- Open the rear cover of control supply unit.
- Pull out the control supply unit.
- Remove the motion amplifier (Y1, X or Y2) on top of specific power supply unit, see [G8.2 Motion amplifier, replacement](#)

2. Replace the power supply unit

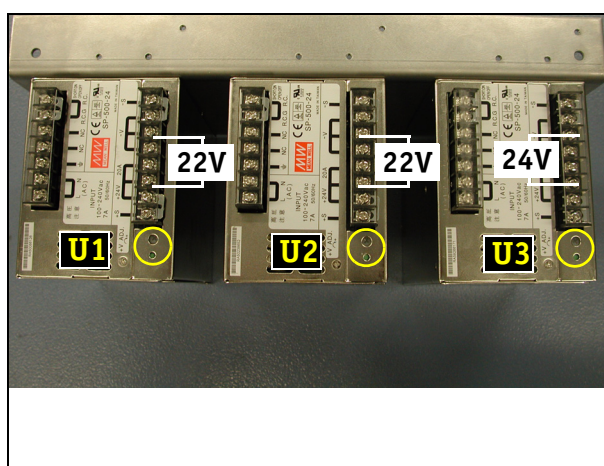
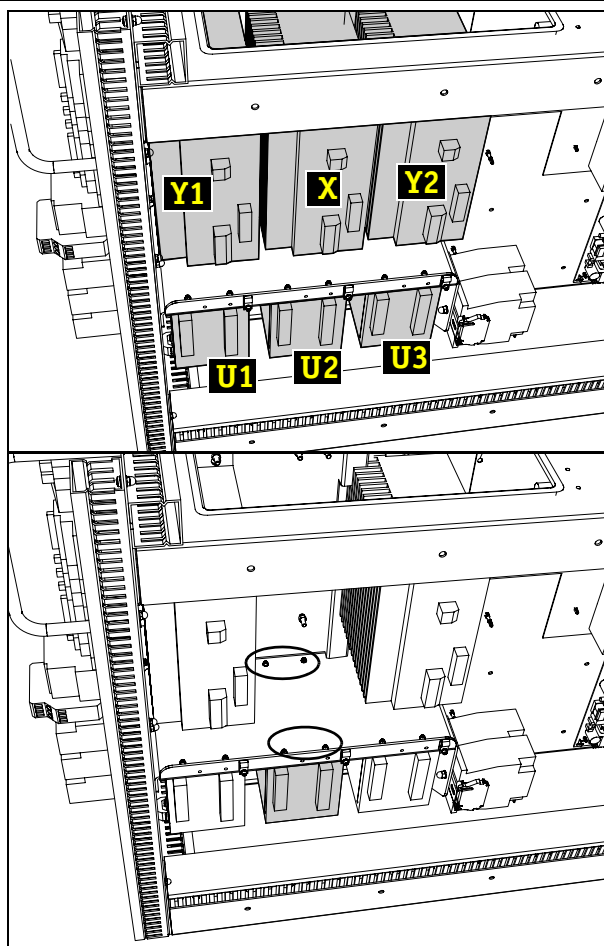
- Loosen the cables.
Note the position of the cables for later reconnection.
- Loosen the four bolts that hold the power supply.
- Hold the power supply to prevent it from dropping down.
- Remove the power supply.
- Mount the new power supply with the four bolts.
- Connect the cables as noted before removal.
- Replace the motion amplifier, see [G8.2 Motion amplifier, replacement](#)

3. Adjust the power supply unit

- Power up the machine.
- Check if the green LED on the power supply is on.
- Check/adjust the supply unit using the adjustment screw.

4. Finalize

- Shift in the control supply unit.
- Close the rear door.



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B8.22 Emergency stop buttons, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s) [A8.4.4 Base, spares](#)



DANGER, HIGH VOLTAGE

Contact may cause electric shock or burn.

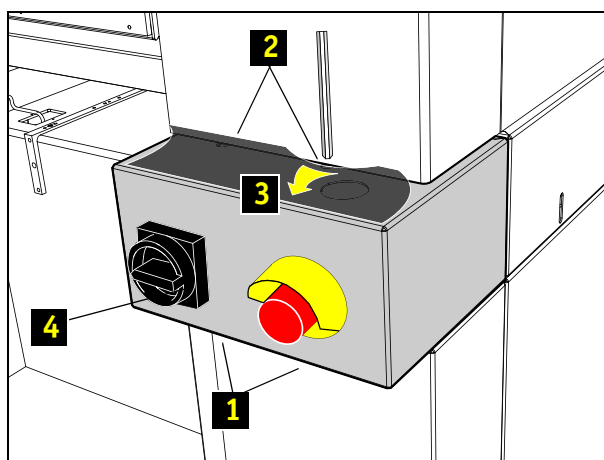
Turn off and lock out machine before servicing, see Safety chapter.

1. Prerequisites

- Remove the front right trolley (when replacing the front emergency stop button).
- Power down the machine.

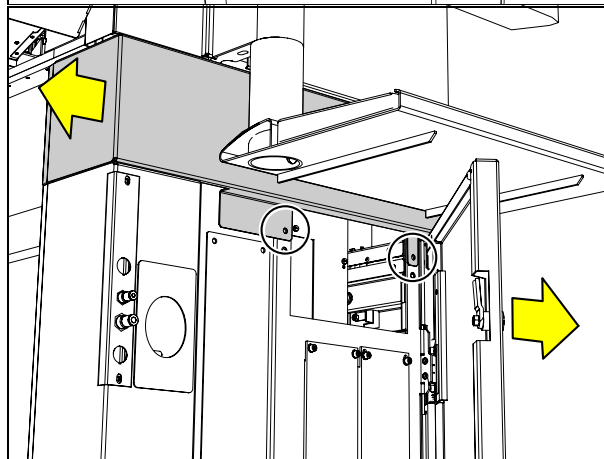
2. Removing the panel, rear

- Remove the two bolts (1) from underneath.
- Loosen the two bolts (2) on top, turn over the cover (3)
- Turn the mains switch (4) in the 'OFF' position and put the cover aside.



3. Remove the panel, front

- Remove the two bolts.
- Slide out the panel.
- Disconnect the connectors.

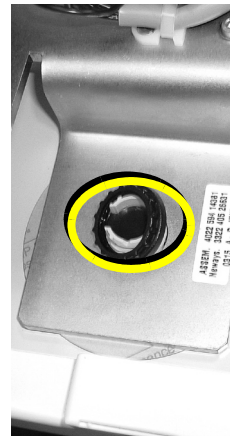
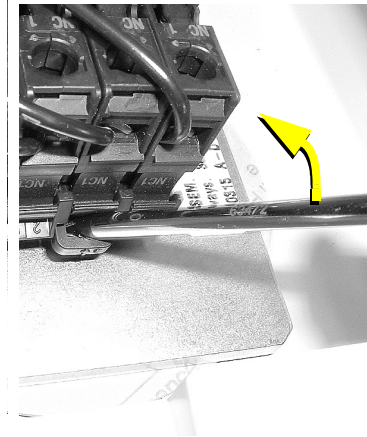


4. Remove switch and button

- Remove the switch by loosening the electrical connections and release the switch from the cover plate by using a small screwdriver.
- Remove the nut and take the button off.

5. Installation

- Installation is in reverse order.



B8.23 Enabling switch, replacement

Estimated time to complete [min.]: -
 Required special tools: -
 Required part(s) [A8.4.4 Base, spares](#)

1. Prerequisites

- Power down the machine.

2. Replace enabling switch

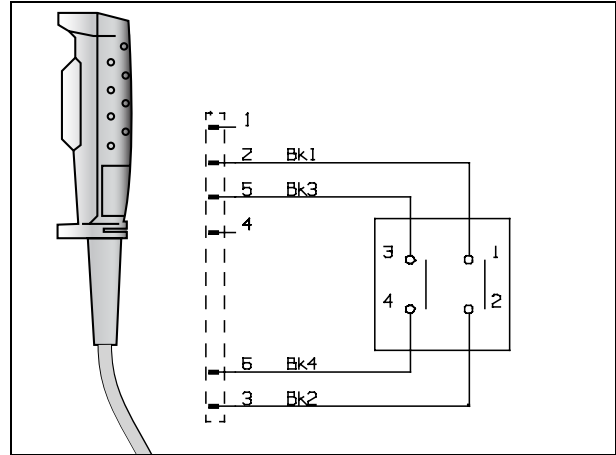
Note: The enabling switch is supplied without cabling.

Note: Note the position of the connections.

- Remove switch from cable.
- Mount new switch.

3. Finalize

- Power up the machine.
- Check function of the enabling switch.



C.BOARD TRANSPORT

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CHAPTER C1 Introduction

C1.1 General

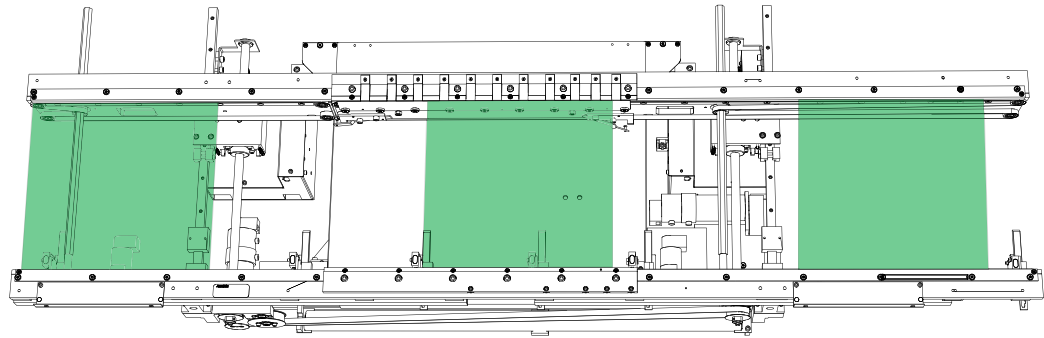


Figure 1 Board transport

The main function of board transport is handling the boards in the machine.

The boards are guided and transported by a front and rear transport rail.

The front transport rail is at a fixed position and the rear transport rail is adjustable in width. In the work area the board is supported and clamped by the lift table when placing components.

Board transport is controlled by the transport controller.

CHAPTER C2 Safety and ergonomics

Board transport is a part of the whole machine.

Safety and ergonomics is only described for the machine as a whole.

CHAPTER C3 Technical specifications

C3.1 Identification

C3.1.1 Board transport, identification

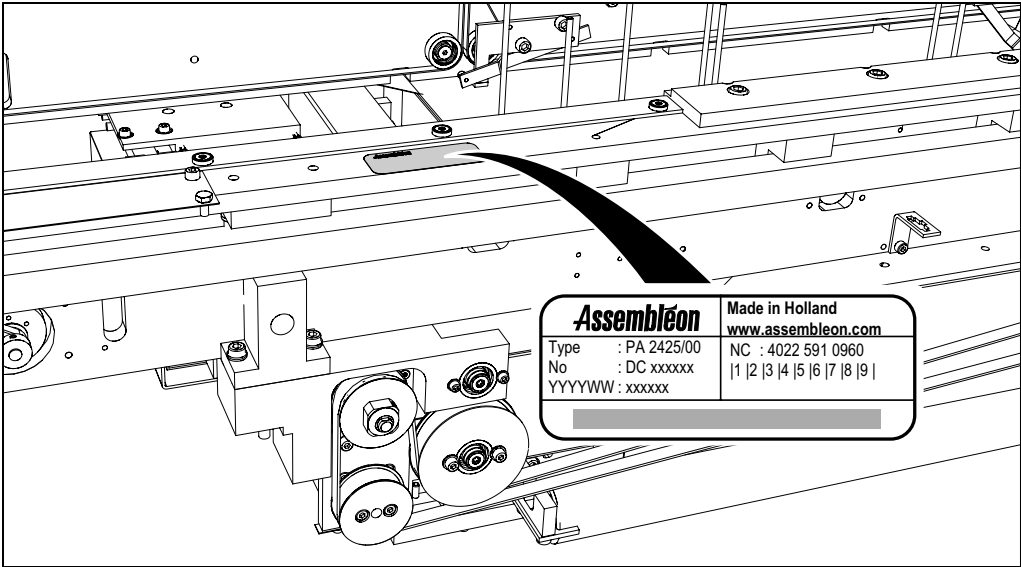


Figure 2 Board transport, identification

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number. 6 digit DC-number.

Figure 3 Board transport, identification

C3-00001.fm

CHAPTER C4 Functional description

C4.1 Board transport

Board transport is a belt driven, front rail fixed, transport device and is divided into two sections: the run-in (RI) and the work area (WA). No mechanical stops are used, the board position is controlled by means of board sensors. The RI section takes the boards coming from the previous transport system.

The lift/clamp/support unit is in the WA beneath the placement heads and brings the boards into position. After clamping and supporting, the boards are processed. After processing the boards flow into the following transport system.

It is also possible to allow boards to pass through without being processed (pass-through mode).

C4.1.1 Transport control

Each transport-section consists of two transport-belts (front and rear transport rail) which support a board on the opposite sides. The belts of a section are connected mechanically and driven by a DC-servo system.

C4.1.2 Transport sequence

The interface between the board transport and the previous and following transport systems is done according to the SMEMA standard interface for single board transport.

The transport sequence is initiated by a SMEMA signal from the previous machine informing that a board is available, assuming that the system is 'not busy'.

The transport system can be seen as 2 separate sections with 3 section changes:

- Previous transport to RI;
- Run-in to WA;
- WA

The transport will be activated when a board is available and the next section is 'not busy' and a software command is generated.

REMARK: During board transport from the work-area to the end of the transport beam, the transport moves a bit backwards to detect a board movement.

C4.1.2.1 Board detection

Boards travelling through the transport are detected by photo-electric sensors.

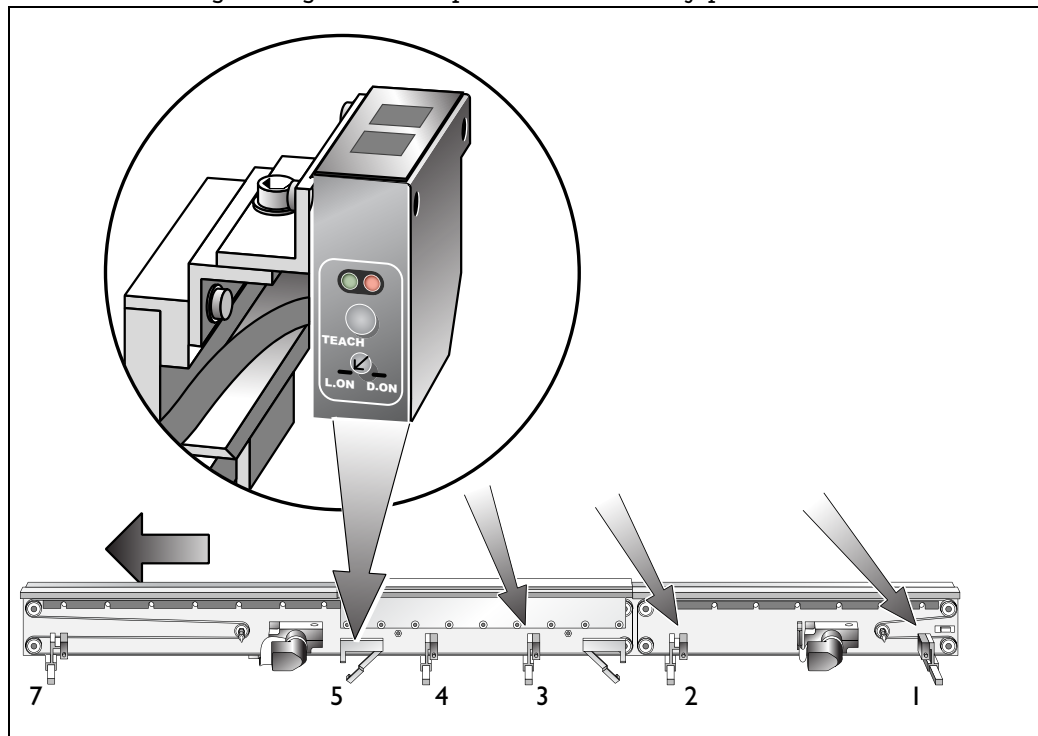


Figure 4 Board sensors on front transport rail

Each section has a sensor for board detection; sensor 1 for RI and sensor 3 for WA.

Sensor 2 is used to stop a board in the RI. Stopping a board in the WA is done in two phases, sensor 4 is used to slow down the speed, and sensor 5 to stop the board. Sensor 7 is used for checking board availability for the next machine.

Sensor 5 is also used to check that a lifted board has been put back in the correct way on the transport belt. It signals that the board is really travelling when the belt is switched left/right. A processed board stays at sensor 5 until the board can be transported to the next transport.

The green LED on the sensor indicates that the sensor is functioning. The red LED indicates that a board is positioned above it, and does not indicate an error unless remaining illuminated after the board has completely passed by. The red LED is energized as the first edge of the board passes over it. The leading edge of the pulse generated is used to signal the start of the next part of the transport sequence.

C4.1.3 Board clamping and supporting

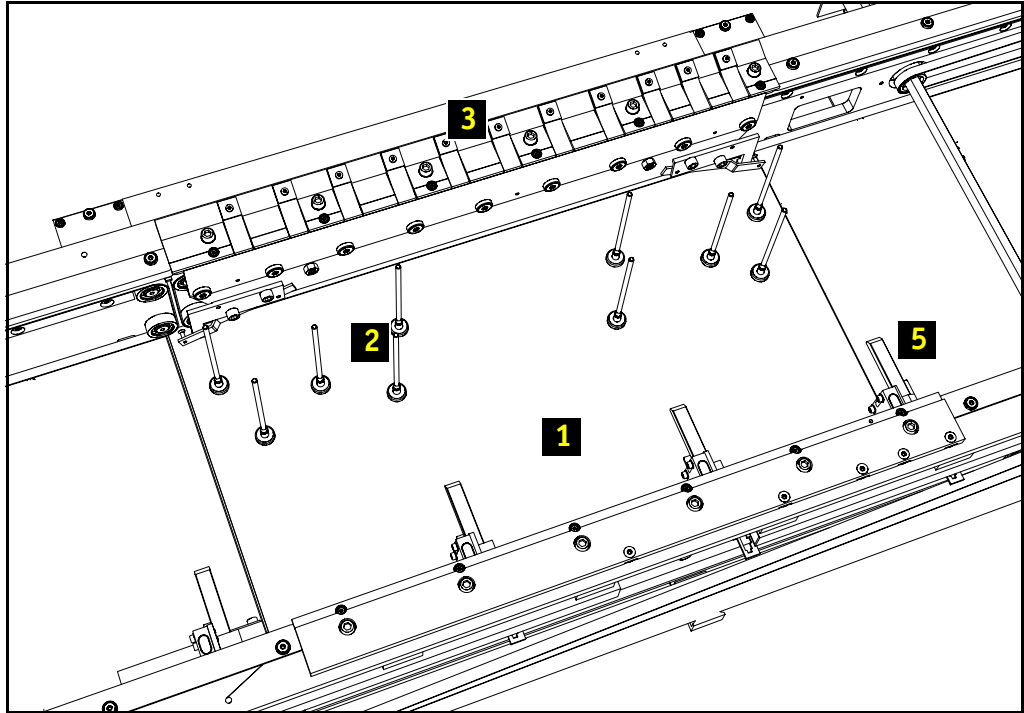


Figure 5 Board clamping and supporting

The lift table (1) is a mechanism which lifts a positioned board from the transport-belt by means of support pins (2) and a clamping blade (3). After the board has been positioned via sensor (5), the lift table is activated and clamps the board such that it remains in position during placement of components. The transport lift motor is equipped with a brake, so that a clamped board remains in position when electrical power is removed.

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C4.1.4 Transport controller

The transport controller acts as a slave to the process controller. This means that all actions of the transport system are initiated by the process controller (Figure 6). Asynchronous events are signalled from transport controller to process controller by means of a Bitbus communication link. The same link is also used for communication between process controller and the other controllers .

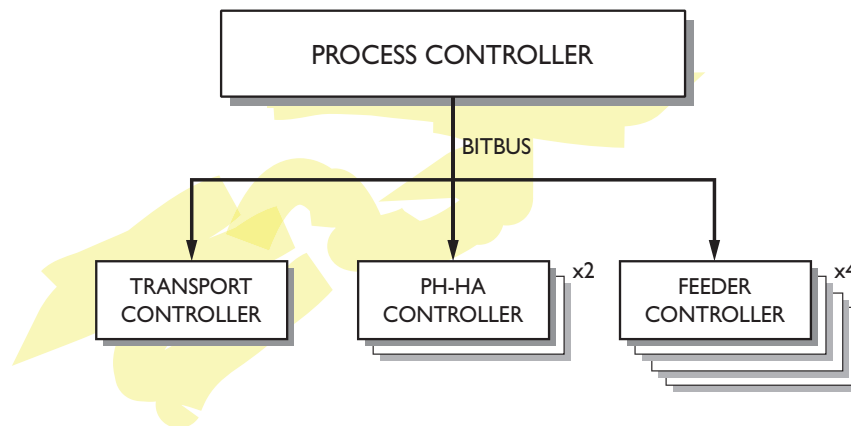


Figure 6 Control architecture

The process controller communicates with the transport controller with a protocol called 'order/reply'. Each function to be performed by the transport controller must be activated by an order from the process controller. The order is sent to a specific task running on the accessed node of the network. Every order is followed by a reply which is sent by the transport controller as an answer to a command (synchronous) or at the time an error or an event occurs (asynchronous). The only asynchronous command is TC_report_message.

For verification of the given command, the firmware checks the message and examines the internal state information. After verification the command is executed acknowledged by the transport controller by sending a response to the process controller.

The hardware of the transport controller board serves the Bitbus protocol, controls some digital Input/Output (I/O), write/read in Flash PROM and controls four Motion Controllers. Three servo amplifiers are installed to drive servomotors. An additional piggy-back board increases digital I/O and adds an extra Motion Controller. A separate servo-amplifier is used for both motors in the lift mechanism and the width adjustment. The principle for controlling the 4 motors is as follows:

- RI, one motor with an encoder, a motion controller and an on-board amplifier;
- WA, one motor with an encoder, a motion controller and an on-board amplifier;
- Width adjustment, one motor with an encoder and a brake, a motion controller and a separate amplifier (one channel of the two shared with the lift);
- Lift, one motor with an encoder and a brake, a motion controller and a separate amplifier (one channel of the two shared with the width adjustment).

CHAPTER C5 Troubleshooting

C5.1 Troubleshooting workflow

The troubleshoot chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.



NOTE: Using the electronic version of the manual will enable the user to use hyperlinks and the 'back' button in the browser to navigate quickly through the information in separate paragraphs.

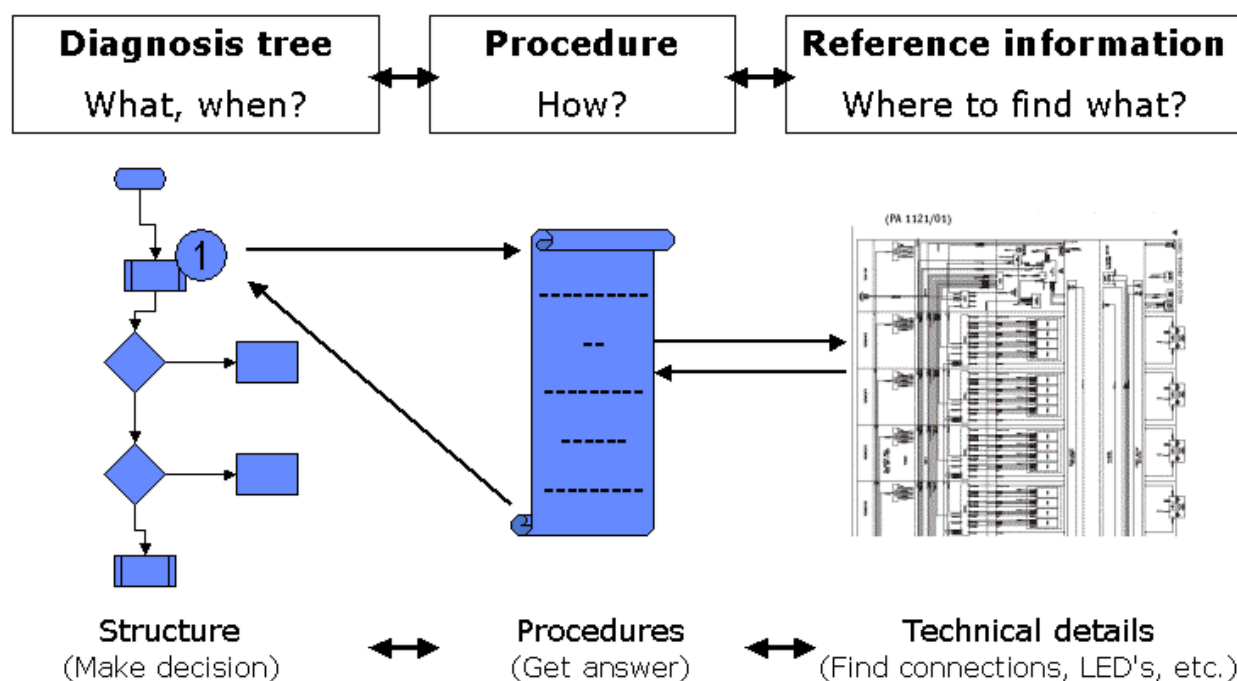


Figure 7 Visual structure of chapter 5

C5.2 Diagnosis trees and tables

C5.2.1 Diagnosis trees, conventions

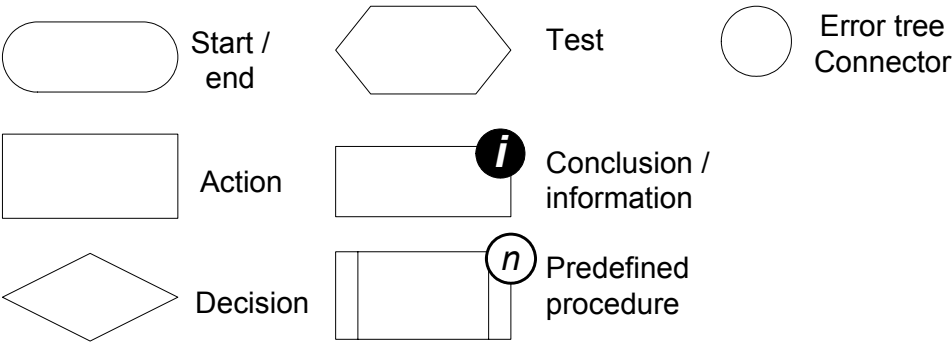


Figure 8 Error trees, conventions

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C5.2.2 Board transport, diagnosis tree

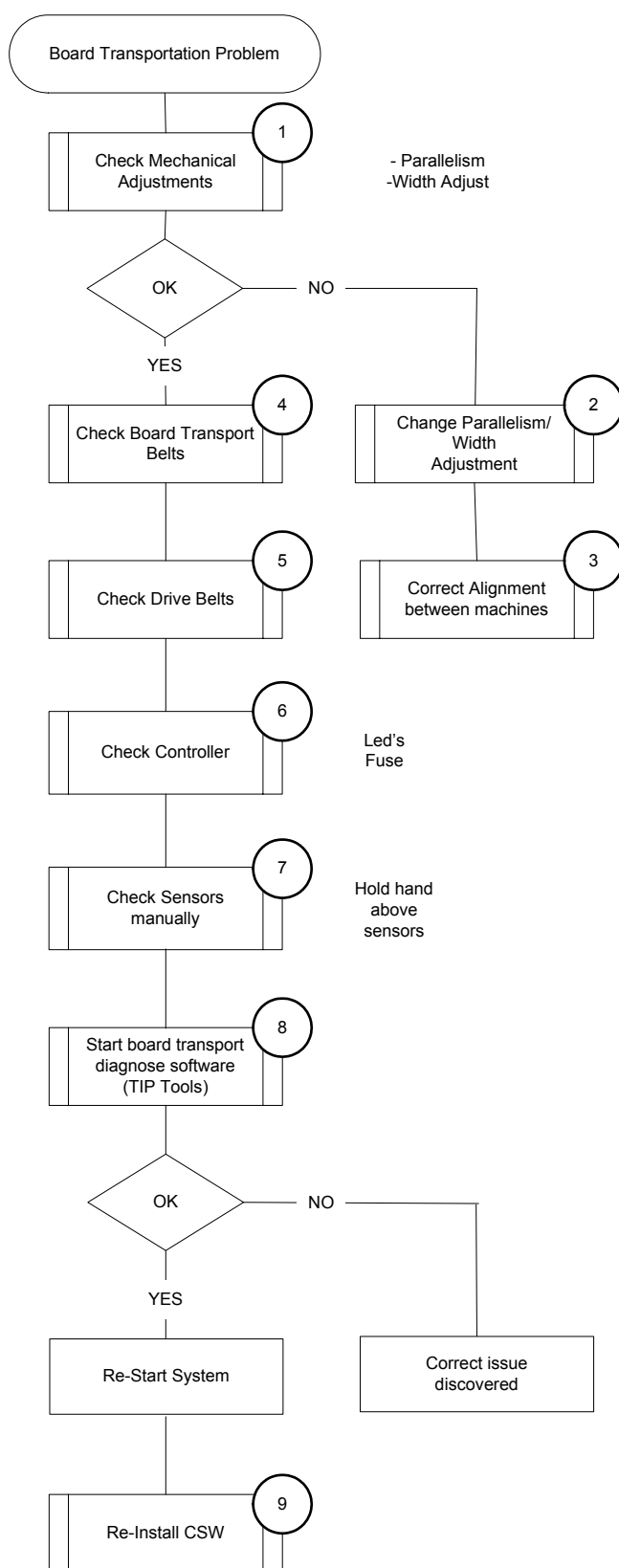


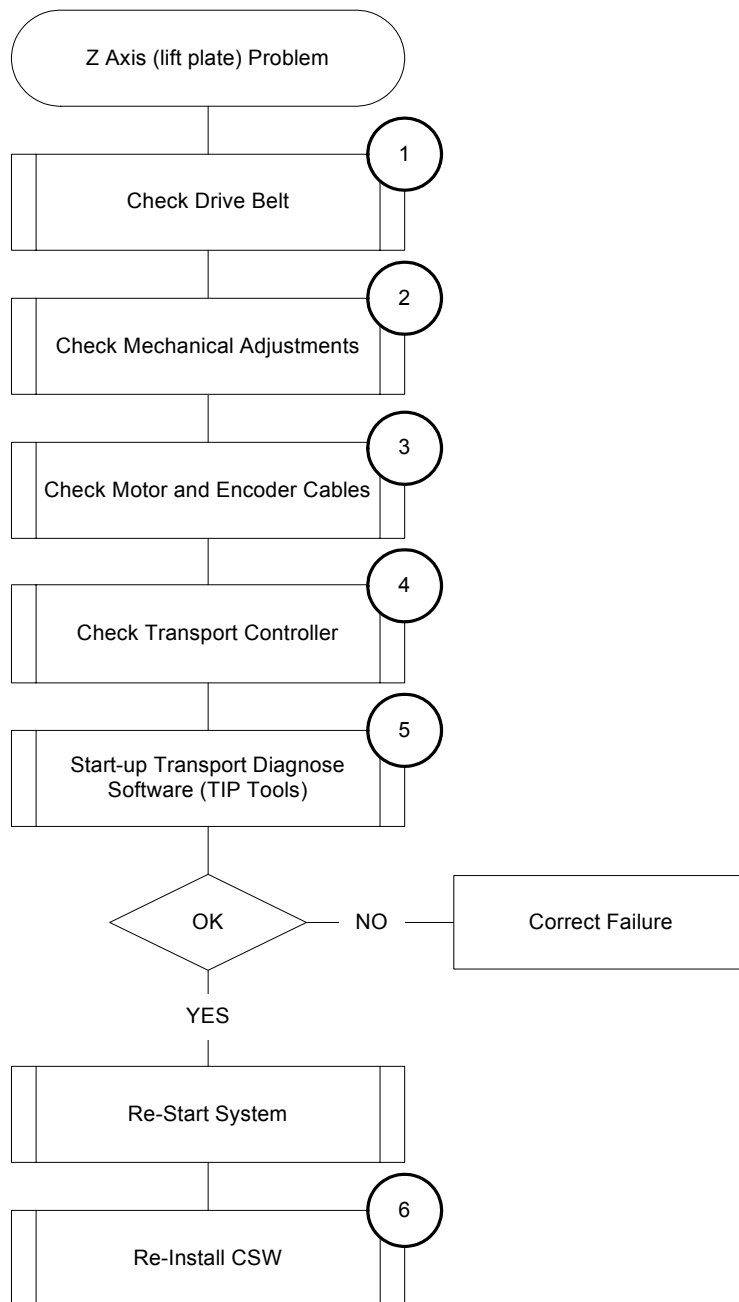
Figure 9

Reference:

1. CHAPTER C6 Measurement, adjustment and calibration
2. C6.9 Transport rails, parallelism adjustment
3. Installation manual
4. C7.4 Transport belts, checking
5. C7.4 Transport belts, checking
6. C5.3.1 Transport controller, LED status check
7. C6.10 Board sensors, adjustment
8. A5.1.3 TIP tools
9. B8.3 Operating software, installation

C5-00004.fm

C5.2.3 Transport width motor, diagnosis tree



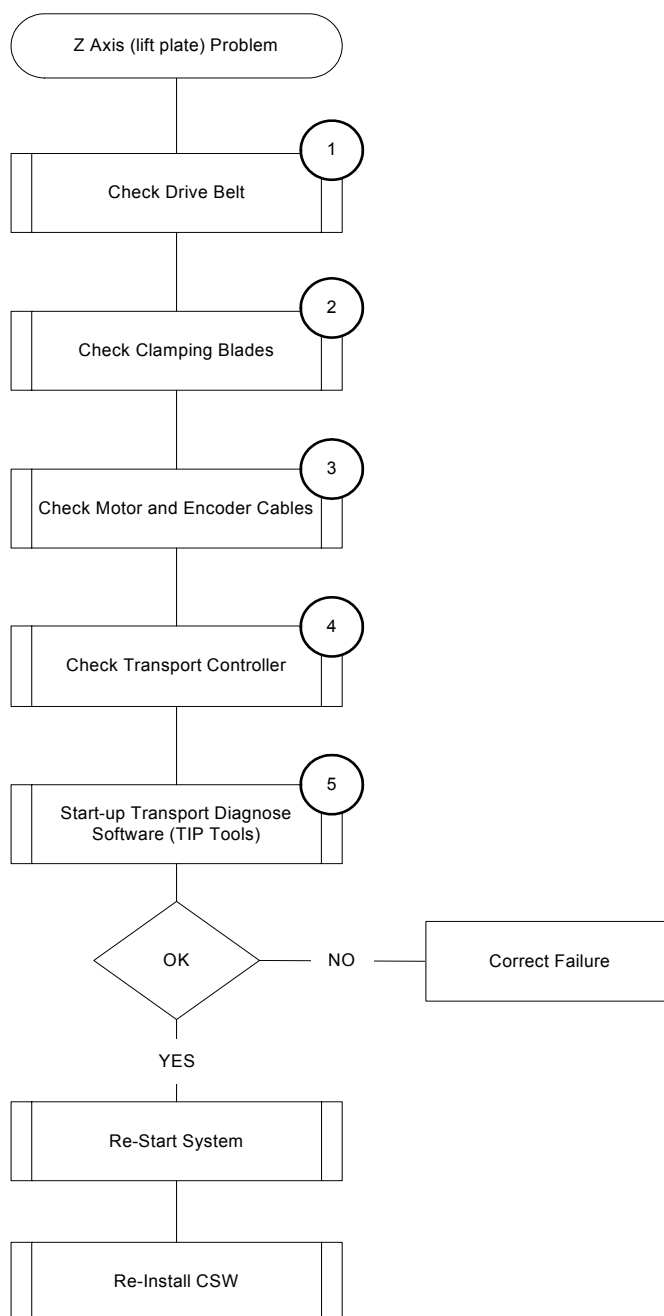
Reference:

1. C7.4 Transport belts, checking
2. CHAPTER C6 Measurement, adjustment and calibration
3. C5.4 Board transport, diagrams
4. C5.3.1 Transport controller, LED status check
5. A5.1.3 TIP tools
6. B8.3 Operating software, installation

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Figure 10

C5.2.4 Transport lift motor, diagnosis tree



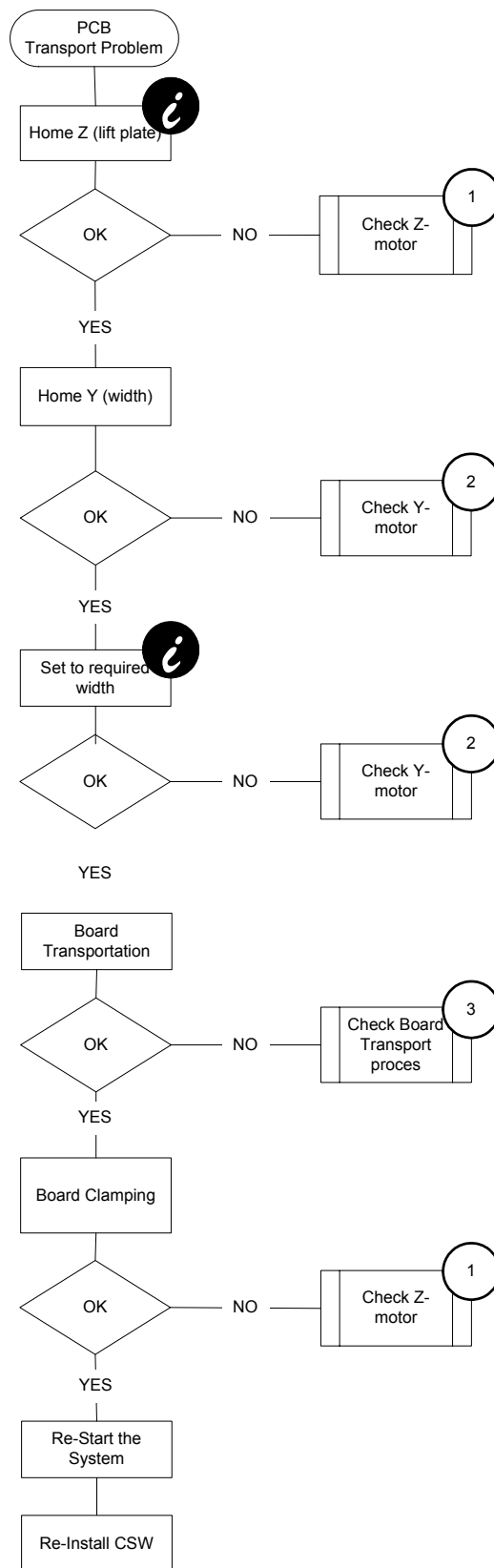
Reference:

1. C7.4 Transport belts, checking
2. C6.7 Board clamps, adjustment
3. C5.4 Board transport, diagrams
4. C5.3.1 Transport controller, LED status check
5. A5.1.3 TIP tools
6. B8.3 Operating software, installation

Figure 11

C5-00002.fm

C5.2.5 Board clamping, diagnosis tree



Reference:

1. C6.4 Transport lift belt, check/adjust tension , C6.11 Lift table, adjusting the zero course EPD
2. C6.2 Transport width belt, check/adjust tension
3. A5.1.3 TIP tools

Figure 12 Board transportation, diagnosis tree

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C5.3 Reference information

C5.3.1 Transport controller, LED status check

This board is mounted in the control supply, see [B5.3.1 Control supply, lay-out](#)

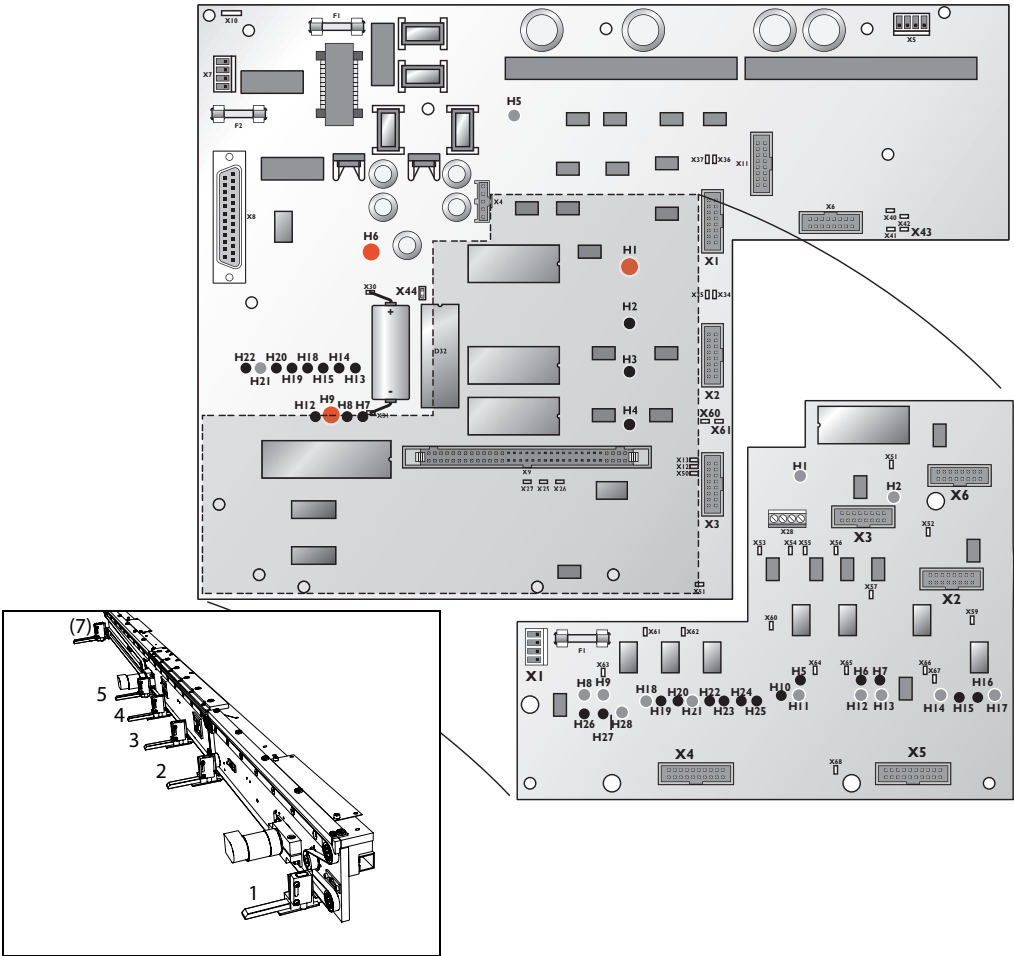


Figure 13 Transport controller, LED status and sensors on board transport

LED	ON/OFF	SYSTEM STATUS	LED	ON/OFF	SYSTEM STATUS
H1	ON	Index WA	H6	ON	Servo power OK (45V)
H2	ON/OFF	Index transport lift	H9	ON	Enable controller
H4	ON/OFF	Index RI	H21	ON/OFF	Enable amplifier WA and RI
H5	ON/OFF	24V supply < 16V (power failure)			
Piggy back					
H1	ON	Enable servo power on	H13	ON	Board sensor, WA-IN (3)
H2	ON	Index Width	H14	ON	Z brake
H7	ON	Board sensor, run-out OUT (7)	H17	ON	SMEMA board available
H8	ON	Board sensor, run-in OUT (2)	H18	ON	SMEMA busy
H9	ON	SMEMA previous machine board available	H21	ON	Width brake
H11	ON	SMEMA next machine busy	H28	ON	Board sensor, run-in IN (1)
H12	ON	Board sensor, WA-POS (5)	No LED		Board sensor, WA-LOW (4)

Figure 14 Transport controller, LED status

C5-00003.fm

C5.3.1.1 Transport controller, connections and fuses

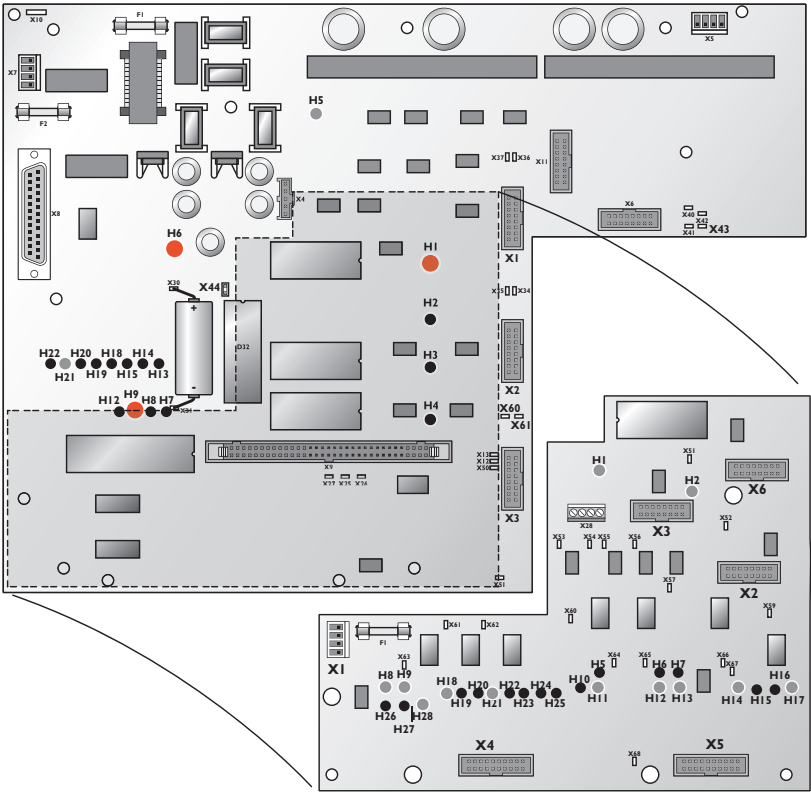


Figure 15 Transport controller, connections and fuses

IDENT	STATUS	FUNCTION
X2	Connector	Servo RI
X5	Connector	Motor WA
X6	Connector	LED Panel
X7	Connector	Power input
X8	Connector	Bitbus communication
X10	Connector	Cabinet ground
X11	Connector	Encoder hoist
X30	Connection	Battery +ve
X31	Connection	Battery -ve
X43	Test point	Monitor ground
X44	Jumper	Enable write EPROM
X60	Test point	Monitor out
X61	Test point	Monitor ground
F1	Fuse	Slow 250V/4A 45V
F2	Fuse	Slow 250V/2A 24V
Piggy back		
X1	Connector	Power input
X2	Connector	Encoder WA
X3	Connector	Encoder width
X4	Connector	I/O left
X5	Connector	I/O right
X6	Connector	Transport amplifier
F1	Fuse	Slow 250V/2A

Figure 16 Transport controller, connections and fuses

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C5.3.1.2 Transport amplifier, LED status

This amplifier is mounted in the control supply, see [B5.3.1 Control supply, lay-out](#)

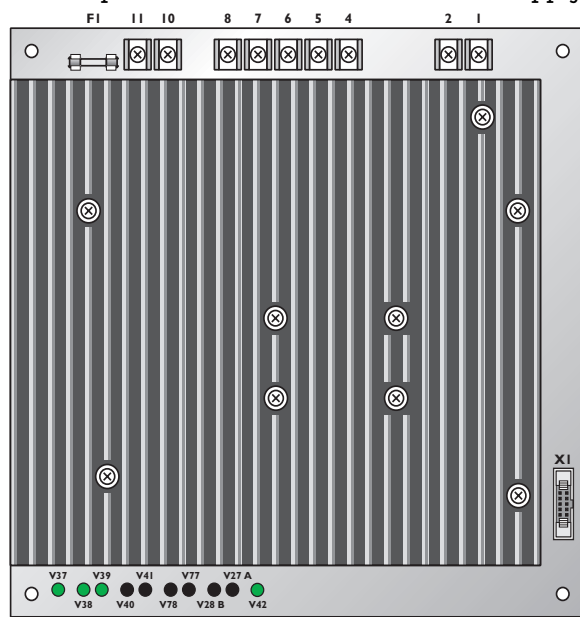


Figure 17 Transport amplifier

LED	ON/OFF	SYSTEM STATUS
V27	OFF	IARMS (RMS over-current protection amplifier A) no error
V77	OFF	IBRMS (RMS over-current protection amplifier B) no error
V28	OFF	IAPEAK (peak current protection amplifier A) no error
V78	OFF	IBPEAK (peak current protection amplifier B) no error
V37	ON	CHOPON (chopper transistor operation)
V38	ON	ENABLE (no error signals)
V39	ON	HSPOK (board in position front)
V40	OFF	OHSPS (over voltage protection of HPS) no error
V41	OFF	HSTEMP (heatsink temperature) no error
V42	ON	LSPSOK (low voltage power supply) no error

Figure 18 Transport amplifier, LED status

C5.3.1.3 Transport amplifier, connections

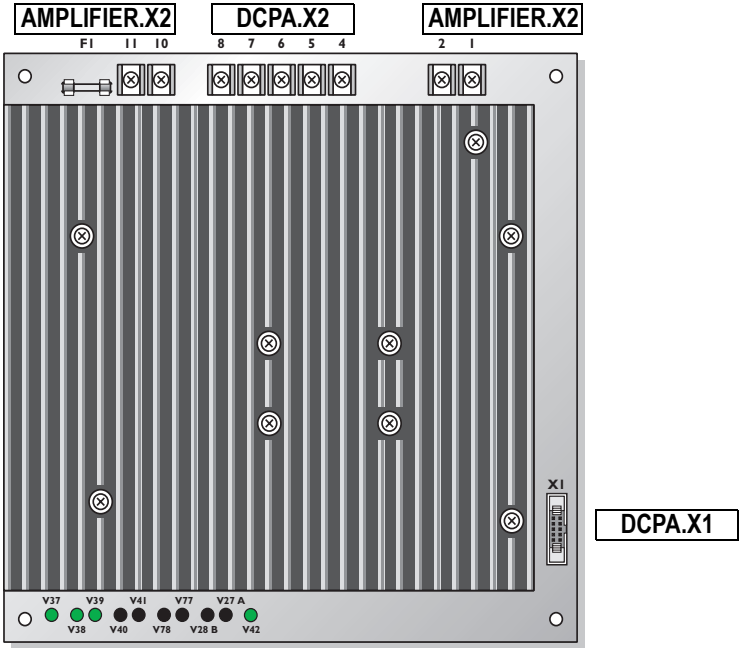


Figure 19 Transport amplifier

ID	STATUS	FUNCTION
AMPLIFIER.X2-1	Connection	Z motor +
AMPLIFIER.X2-2	Connection	Z motor -
DCPA.X2-4	Connection	+ 45 V
5	Connection	Ballast Limms
DCPA.X2-6	Connection	0 V
DCPA.X2-7	Connection	0 V
DCPA.X2-8	Connection	+ 24 V
AMPLIFIER.X2-10	Connection	Width adjust motor -
AMPLIFIER.X2-11	Connection	Width adjust motor +
DCPA.X1	Connector	To transport controller
F1	Fuse	Slow 2A

Figure 20 Transport amplifier, connections

C5-00003.fm

C5.3.2 Board sensors, LED signalling

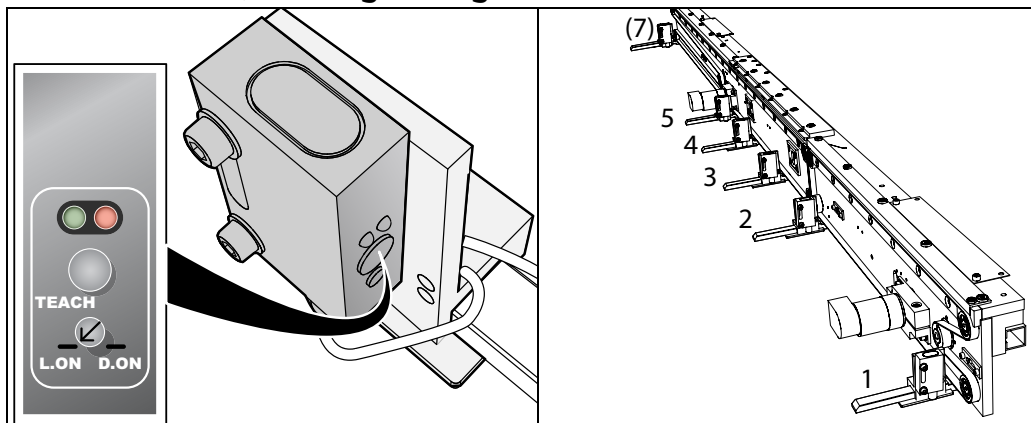


Figure 21 Board sensors, LED signalling

Meaning of the LED's:		
ORANGE LED = ON means object detected		
GREEN LED= ON means stable detection of presence/absence of the object.		
ORANGE LED	GREEN LED	
ON	ON	Object properly detected
OFF	ON	Object properly absent
ON	OFF	Object detected (poor detection)
OFF	OFF	NO object detected (poor detection)

Figure 22 Board sensors, LED signalling

C5.4 Board transport, diagrams

C5.4.1 Transport controller, electrical diagram

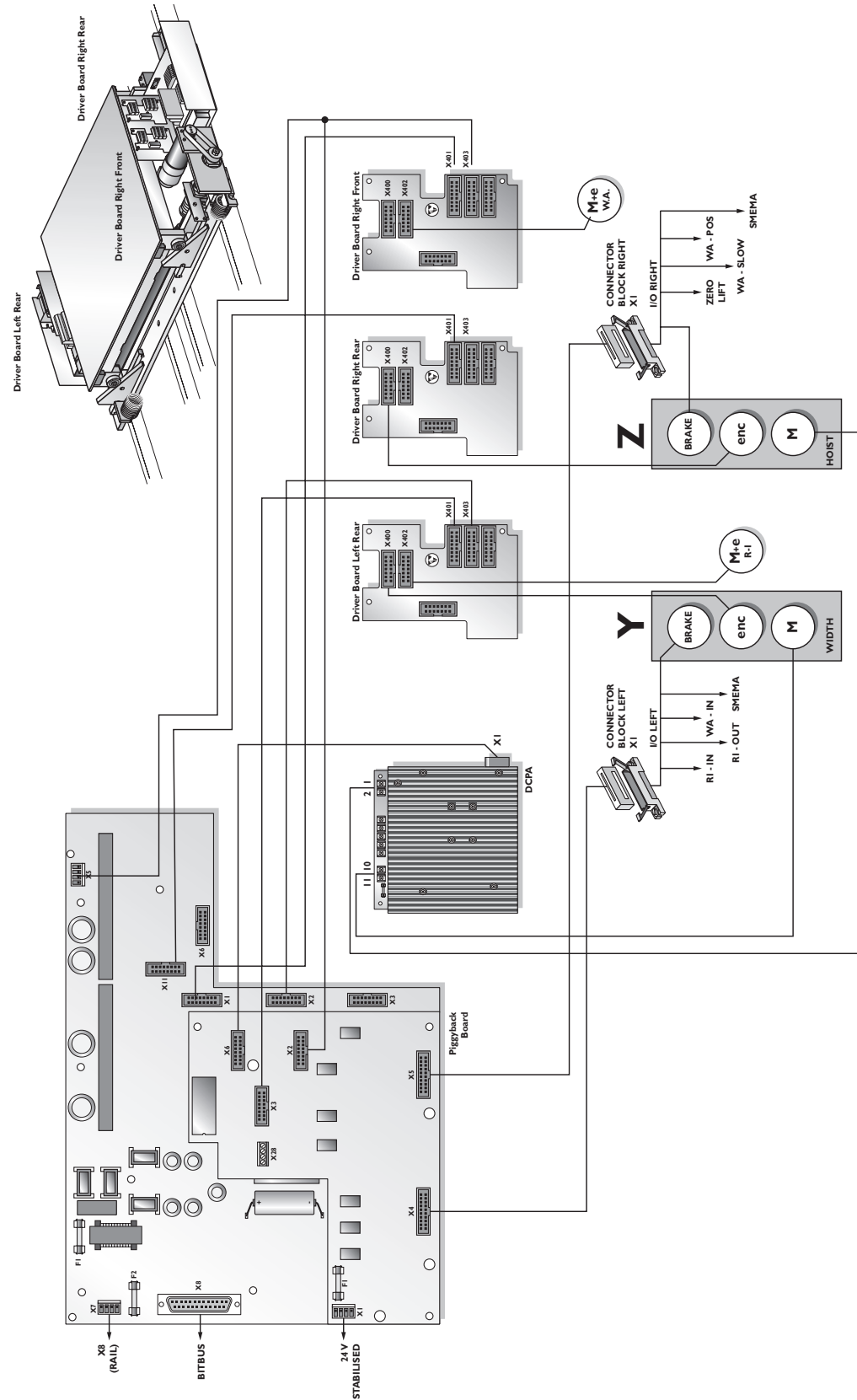


Figure 23 Transport controller, electrical diagram

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C5.4.2 Transport width motor, diagram

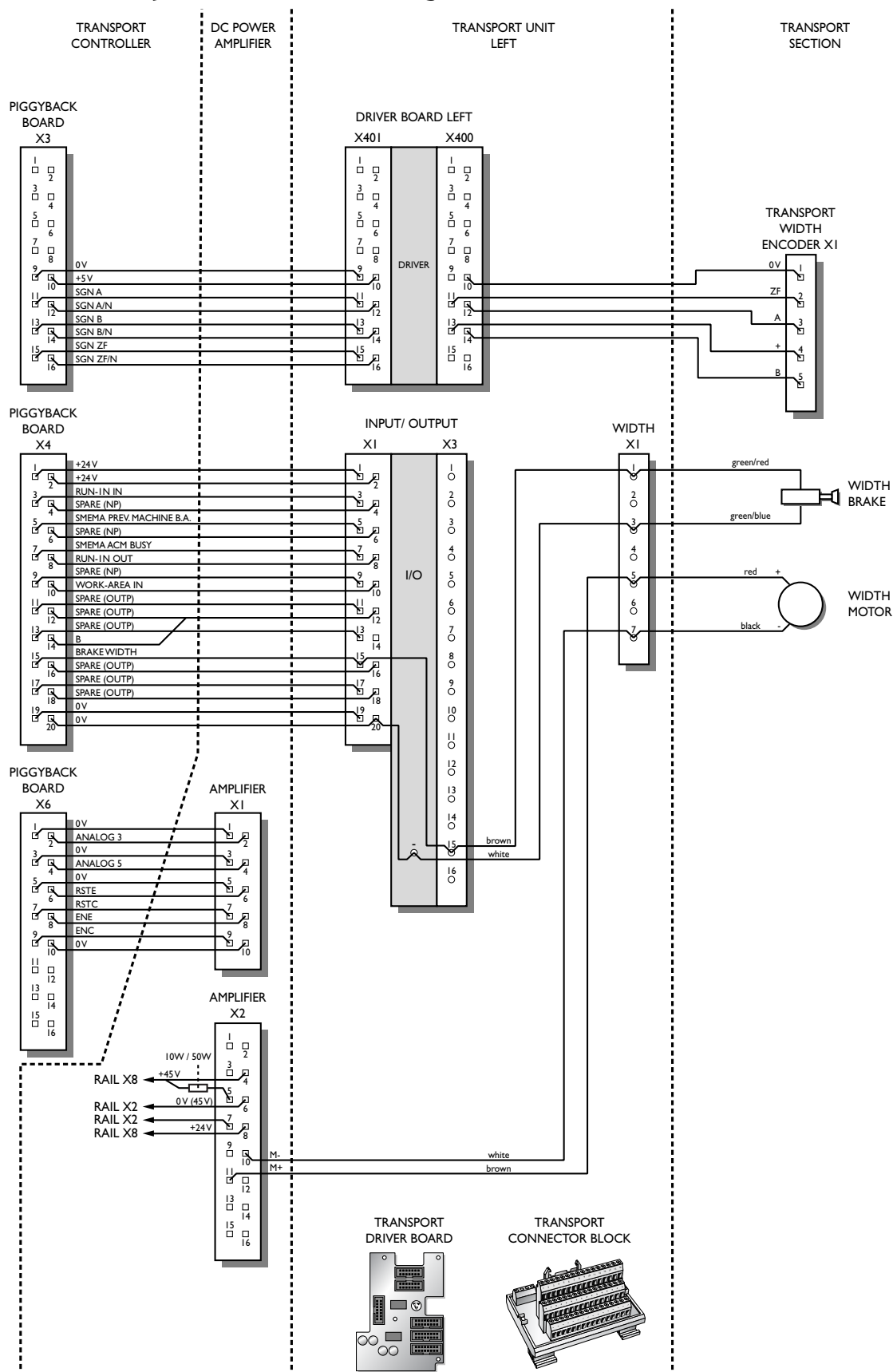


Figure 24 transport width motor, diagram

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C5.4.3 Transport lift motor, diagram

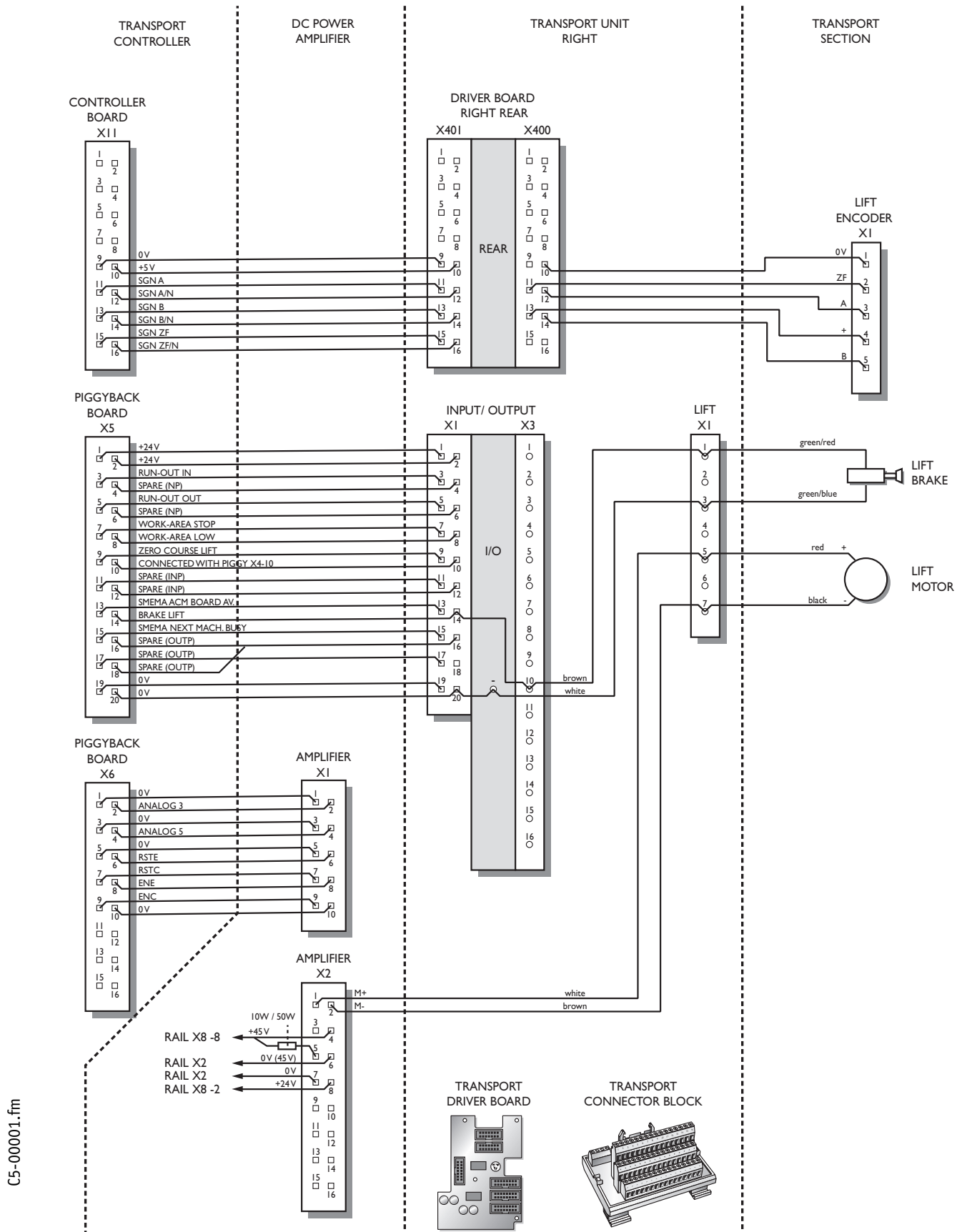


Figure 25 Transport lift motor, diagram

C5.4.4 Transport drive belt motors, diagram

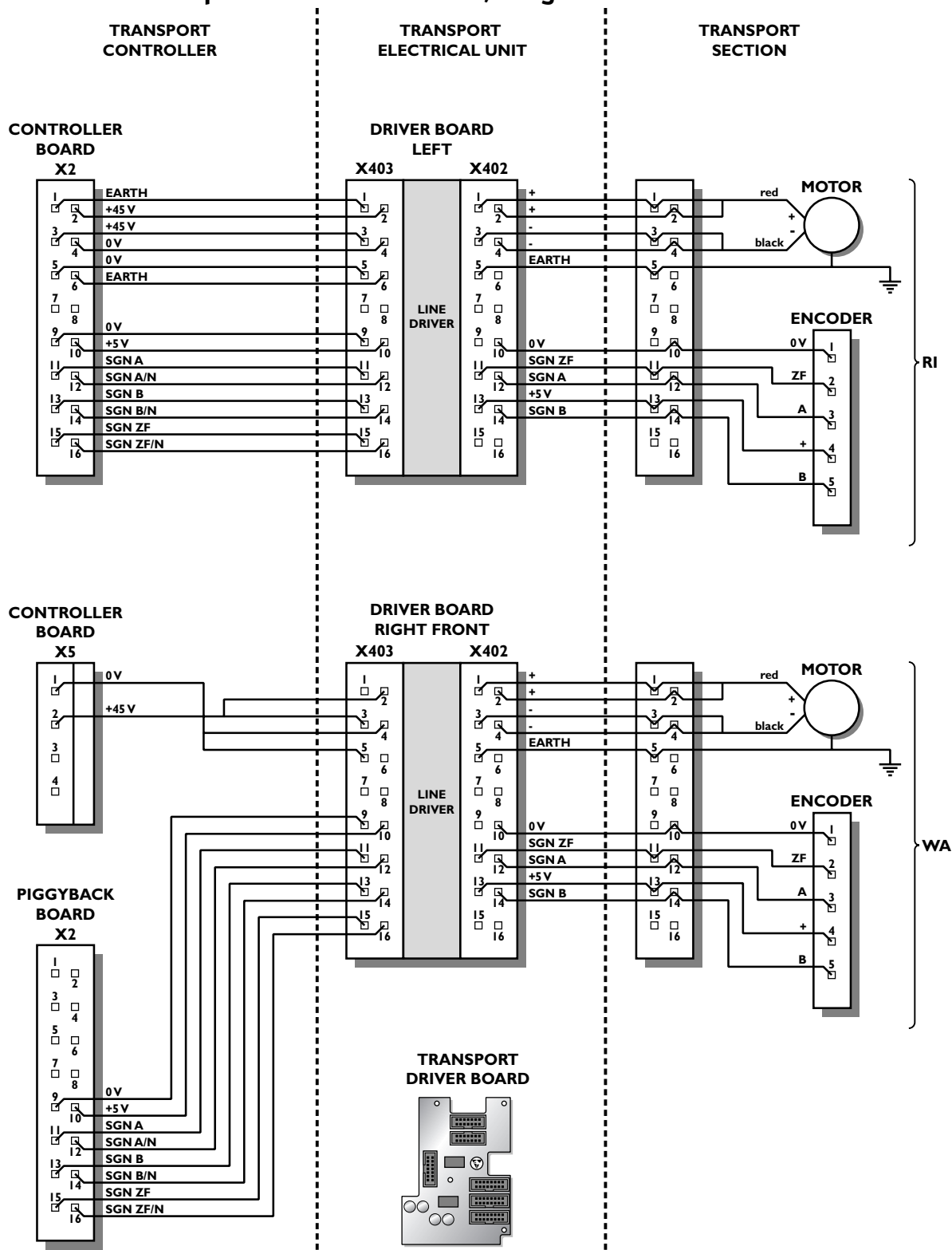


Figure 26 Transport drive belt motors, diagram

C5-00001.fm

C5.4.5 Board sensors, diagram

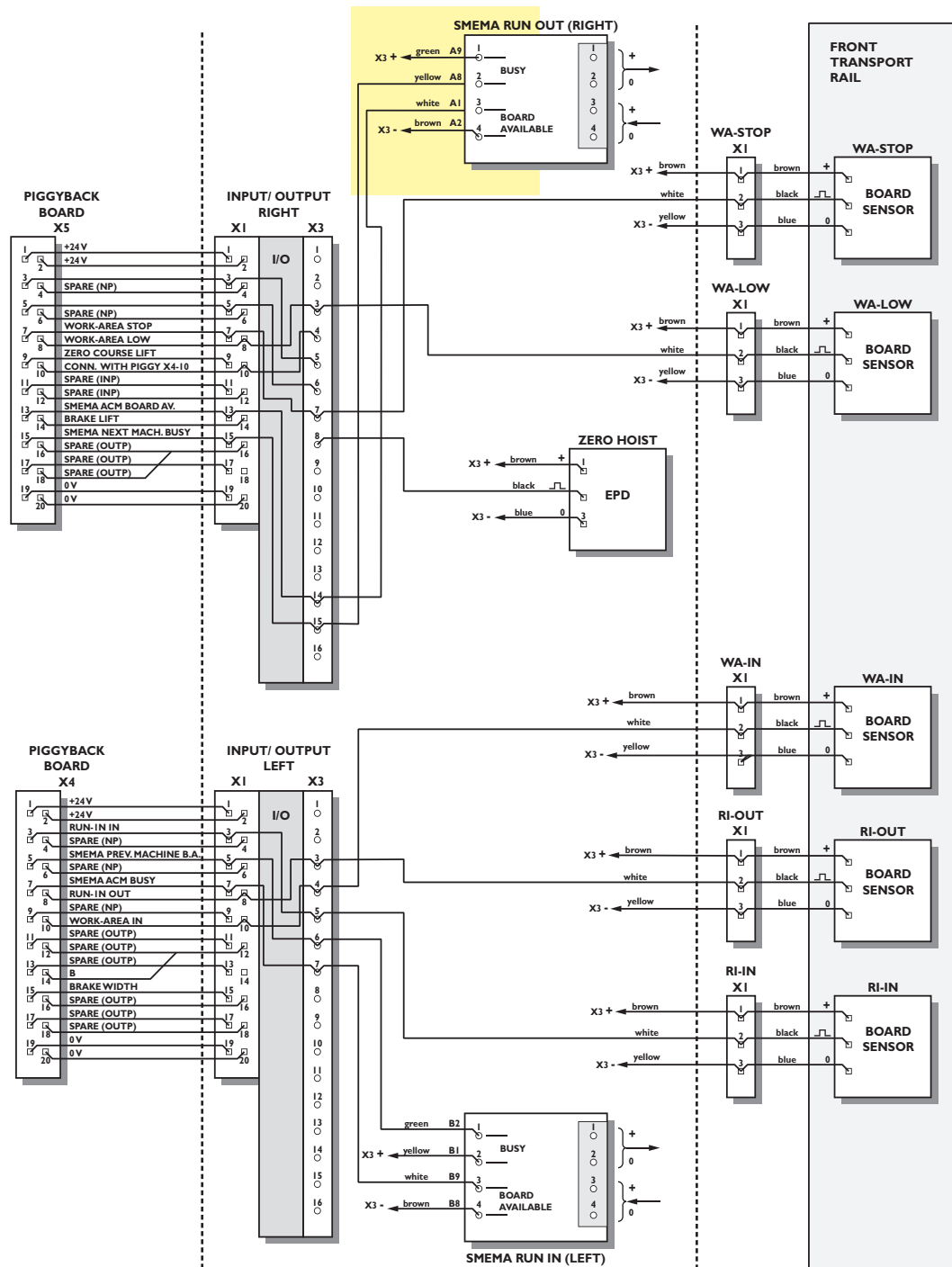


Figure 27 Board sensors, diagram

C5-00001.fm

C5.4.6 Board transport, electrical diagram

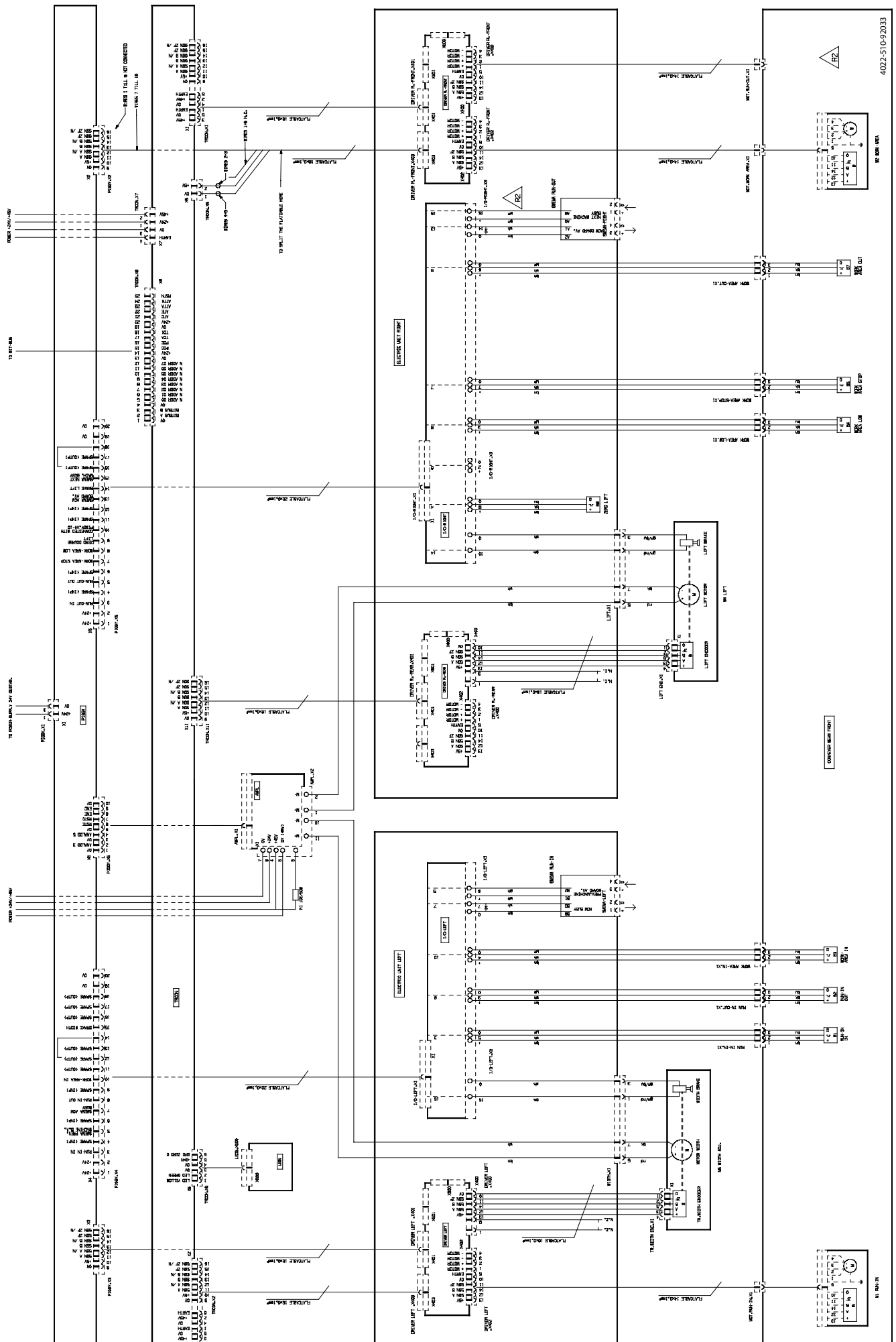


Figure 28 Board transport, electrical diagram

CHAPTER C6 Measurement, adjustment and calibration

Adjustments, maintenance and repair of this equipment should only be carried out by qualified personnel. More detailed repairs not included in this manual should be carried out by the Assembléon Service Centre.



NOTE: When the system is switched off by means of the main switch, this main switch must always be locked by a padlock!



NOTE: Before starting maintenance work, operate correct system shut-down procedures and switch off the factory power at the main power switch

C6.1 Transport, release width or lift brake manually

Estimated time to complete [min.]: -

Required special tools. Power supply (24 Volt, 5A), see
[A8.6.5 Recommended special tools](#)

Required part(s) -

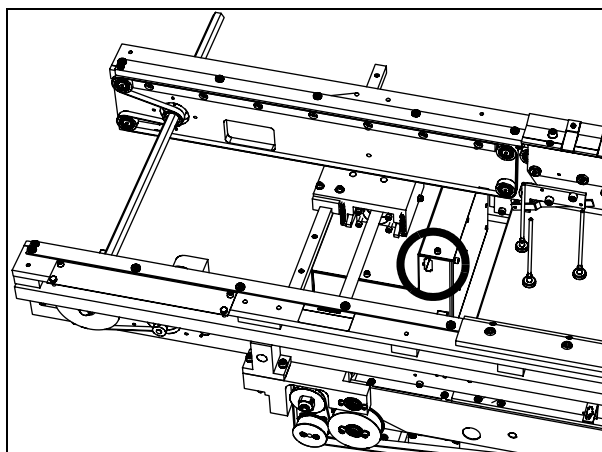


NOTE: Use TIP tools ([A5.1.3 TIP tools](#)), otherwise a 24V power supply is required.

1. Release transport width brake

- Disconnect connector X1.
- Apply 24V between pin 1 and 3 on the connector, pin 1 positive.

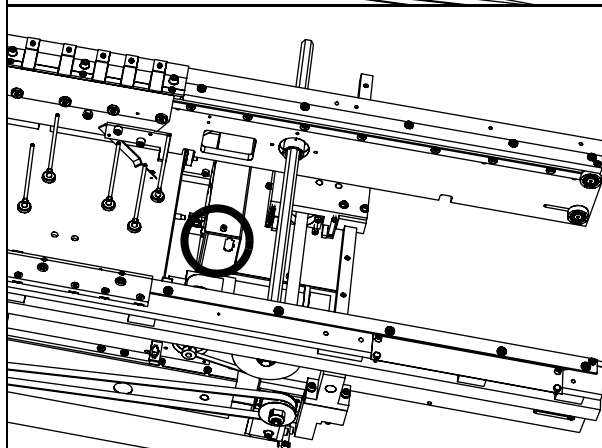
Note: The brake can also be released using TIP tools.



2. Release transport lift brake

- Disconnect connector X1.
- Apply 24V between pin 1 and 3 on the connector, pin 1 positive.

Note: The brake can also be released using TIP tools.



C6-00001.fm

C6.2 Transport width belt, check/adjust tension

Estimated time to complete [min.]: 5/5 (checking/adjusting)

Required special tools. Belt tension indicator,
see [A8.6.6 Recommended Assembléon tools](#)

Required part(s) -

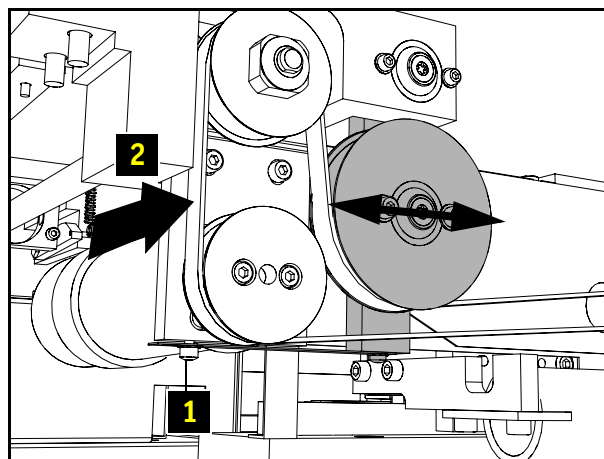
1. Check the belt tension

- Check the belt tension at location 2:
375 ± 40 Hz.

2. Adjust the belt tension

Always use a belt tension indicator to avoid damage to the transport width motor!

- Loosen the bolt (1) to change position of gear bracket.
- Tighten the bolt (1).
- Re-check belt tension at location 2.



C6.3 Transport drive belt, check/adjust tension

Estimated time to complete [min.]: 5/5 (checking/adjusting)

Required special tools. Belt tension indicator,
see [A8.6.6 Recommended Assembléon tools](#)

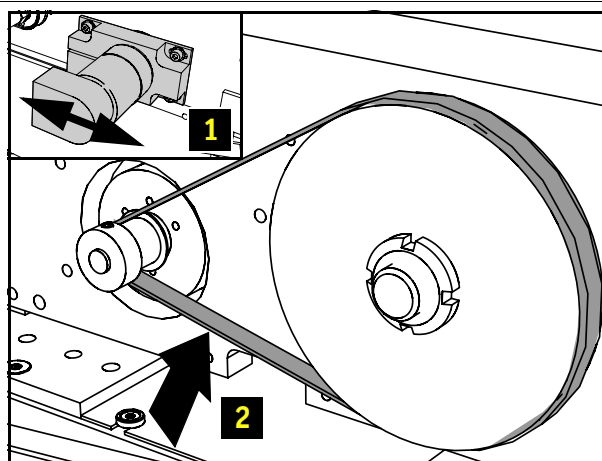
Required part(s) -

1. Check the belt tension

- Check the belt tension at location 2:
100 ± 40 Hz.

2. Adjust the belt tension

- Loosen three screws of drive belt motor bracket (1).
- Change position of drive belt motor bracket.
- Tighten three screws of drive belt motor bracket (1).
- Re-check belt tension at location 2.



C6-00012.fm

C6.4 Transport lift belt, check/adjust tension

Estimated time to complete [min.]: 5/5 (checking/adjusting)

Required special tools. Belt tension indicator,
see [A8.6.6 Recommended Assembléon tools](#)

Required part(s) -



NOTE: Use TIP tools ([A5.1.3 TIP tools](#)), otherwise a 24V power supply is required.

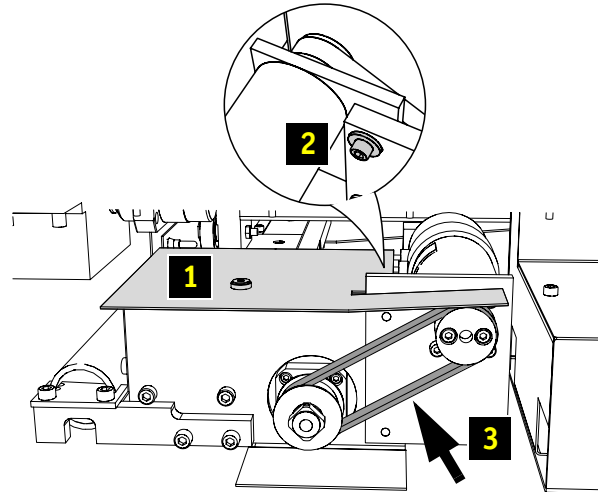
1. Check belt tension

- Release the transport lift brake, using TIP tools, or see [C6.1 Transport, release width or lift brake manually](#)
- Check the belt tension at location 3:
140 ± 40 Hz.

2. Adjust the belt tension

Always use a belt tension indicator to avoid damage to the lift motor!

- Remove cover (1).
- Loosen screw of transport lift motor bracket (2).
- Change position of transport lift motor bracket.
- Re-check belt tension at location 3.
- Install cover (1).



C6.5 Transport lift table, parallelism adjustment

Estimated time to complete [min.]: 5/15 (checking/adjusting)

Required special tools. -

Required part(s) -



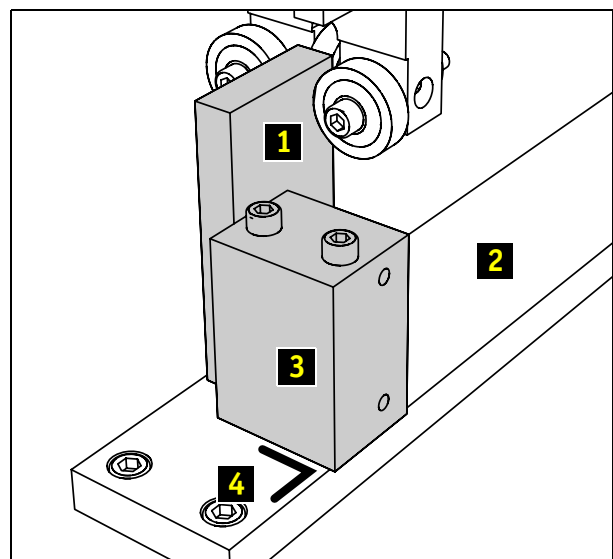
NOTE: Use TIP tools ([A5.1.3 TIP tools](#)), otherwise a 24V power supply is required.

1. Prerequisites

- Release the transport lift brake, using TIP tools, or see [C6.1 Transport, release width or lift brake manually](#)
- Raise the lift table.

2. Vertical angle check

- Check the horizontal angle (4) of the lower bearing blocks (3) to the bottom bar (2) = 90°.
- If this is not 90°:
 - * Loosen the screws of the left bearing block.
 - * Set the horizontal angle of the lower bearing block to 90°.
 - * Tighten the screws of the lower bearing block and re-check the angle.
- Repeat the procedure for the other bearing block.

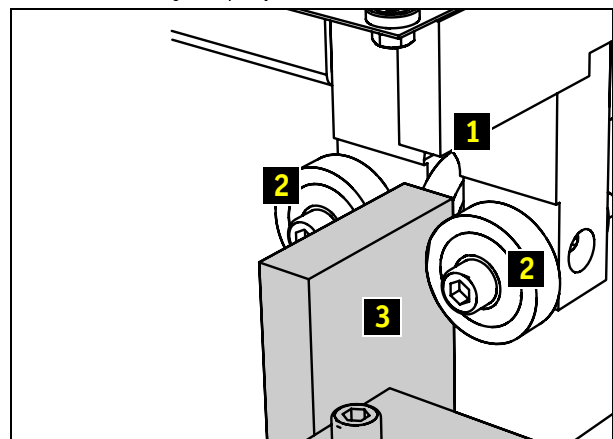


3. Bearing parallelism check

- Lower and raise lift table and make certain that both left and right paired bearings (2), and left and right middle bearings (1) run smoothly on the upper bearing blocks (3).

4. Check guiding of lift table in X-direction

- Raise the lift table.
- Loosen the screws of the left lower bearing block (3).
- Set the left lower bearing block to a nominal position so that the left middle bearing touches the left upper bearing block (1).
- Apply hand pressure to the right side of the support plate unit until the left middle bearing runs smoothly on the left upper bearing block and tighten the screws.
- Check the adjustment of the right middle bearing.
Re-adjust the right lower bearing block until the left and right middle bearings run smoothly on the upper bearing blocks.



C6-00004.fm

C6.6 Transport lift table, levelling

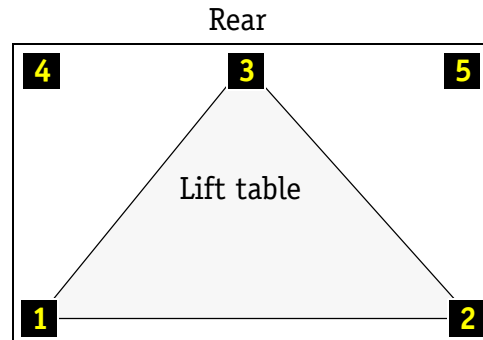
Estimated time to complete [min.]: 45

Required special tools: Height block, dial gauge with support, [A8.6.6 Recommended Assembléon tools](#)

Required part(s) -

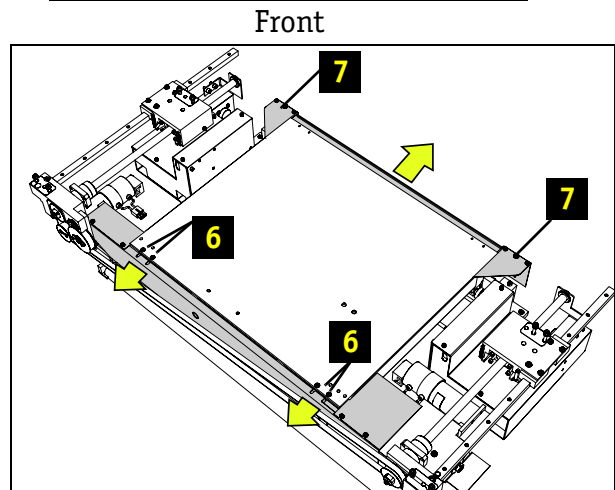
1. Prerequisites

- Release the transport lift brake, use TIP tools [A5.1.3 TIP tools](#) or see [C6.1 Transport, release width or lift brake manually](#) .



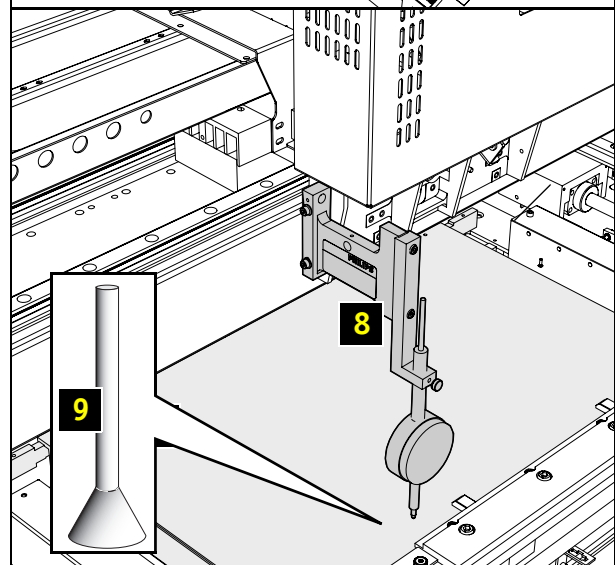
2. Remove covers of lift table

- Loosen four screws at the front (6) and slide transport security plate to the front.
- Remove two screws (7) and take rear security plate out.
- Raise the lift table to its upper position (minus approx. 2 mm).



3. Position dial gauge with support

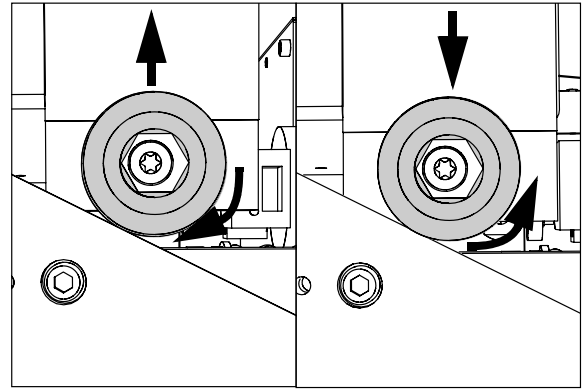
- Mount dial gauge according picture (8).
- Place the height block (9) on the lift table above an eccentric bearing (position 1).



C6-00005.fm

4. Check and adjust levelling of lift table

- Check if the eccentric bearing at the rear (3) is in its middle position.
- Stroke of the bearing is 0.5 mm
- Bring the dial gauge over the height block and note the value (H1).
- Repeat the procedure for a second eccentric bearing (position 2), note the value (H2).
- Repeat the procedure for the third eccentric bearing (position 3), note the value (H3).
- Check the level, $H1 = H2 = H3 (\pm 0.1 \text{ mm})$.
- If the support plate unit is not level at these points:
- Take point 3 as a reference point.
- Using a torque screwdriver, release the locking screws of the eccentric bearings.
- Adjust level of support plate unit until $H1 = H2 = H3 (\pm 0.1 \text{ mm})$.
- Tighten the locking screws and re-check the values.

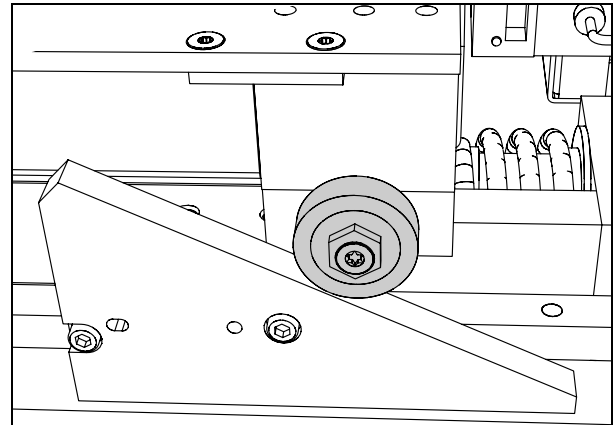


5. Checking lift table corners (H4,H5)

- Place the height block on each corner of the lift table.
- Bring the dial gauge over the height block and check the level, $H1 = H2 = H4 = H5 (\pm 0.1 \text{ mm})$.

If the support plate unit is not level at these points:

- Using a torque screwdriver, release the locking screws of the eccentric bearings.
- Adjust level of support plate unit until $H1 = H2 = H4 = H5 (\pm 0.1 \text{ mm})$. Tighten the locking screws and re-check the values.



6. Finalize

- Remove dial gauge and height block.
- Mount covers.

C6.7 Board clamps, adjustment

Estimated time to complete [min.]: 20

Required special tools. -

Required part(s) -



NOTE: Use TIP tools ([A5.1.3 TIP tools](#)), otherwise a 24V power supply is required.

1. Prerequisites

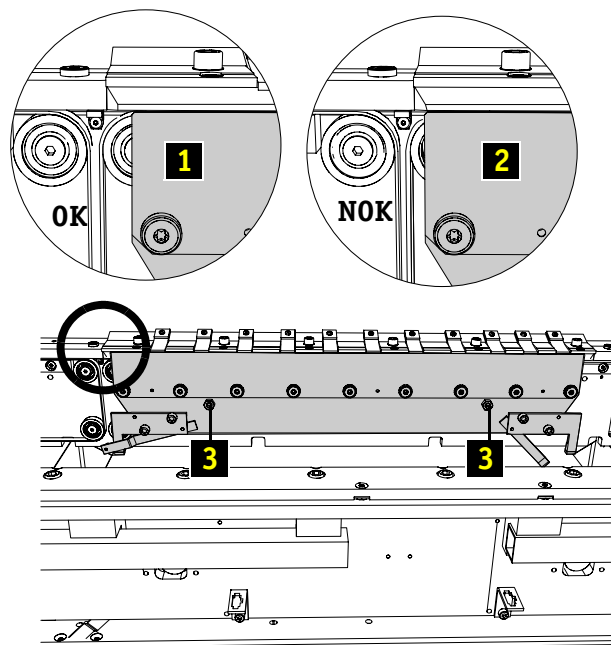
- Lower the lift table, release the transport lift brake, using TIP tools [A5.1.3 TIP tools](#), or see [C6.1 Transport, release width or lift brake manually](#)

2. Adjust the rear board clamp in X-direction

- Check that the rear board clamp covers half of the WA conveyor belt (1) and does not exceed the first bearing (2).

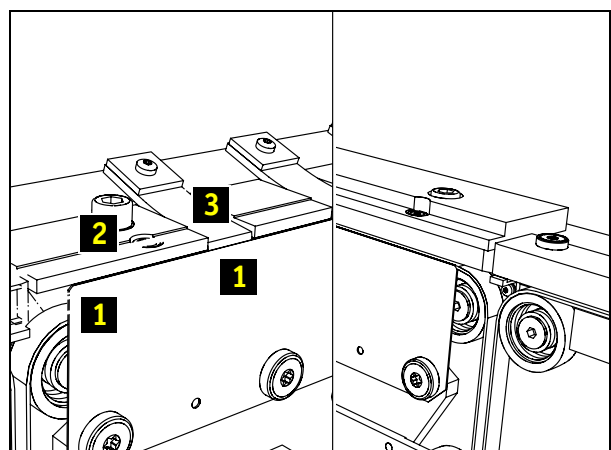
If the clamping strip position is incorrect:

- Loosen the two lock nuts (3) of the eccentric adjustment screws.
- Move the rear board clamp to the correct position using the adjustment screws and tighten the two lock nuts (1).



3. Adjust the board clamps in Z-direction

- Raise the lift table.
- Measure the distance between the rear board clamp (1) and the clamping bar (2) at the front edge (0 mm).
- Measure the distance between the rear board clamp (1) and between the plastic springs (3) at the rear edge (0 mm).
- If the distances are not correct check the height adjustment of the transport rails, see [C6.6 Transport lift table, levelling](#))
- Repeat the procedure.

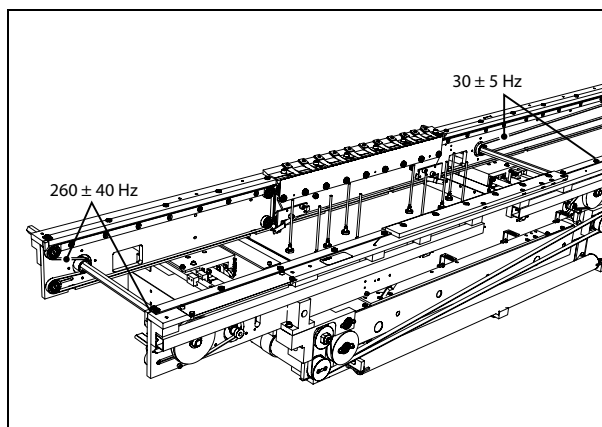


C6-00006.fm

C6.8 Transport belts, check/adjust tension

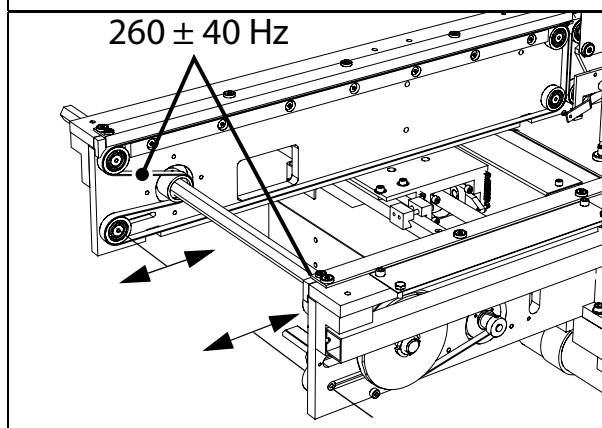
Estimated time to complete [min.]:	5/5 (checking/adjusting)
Required special tools.	Belt tension indicator, see A8.6.6 Recommended Assembléon tools
Required part(s)	-

1. Check tension of transport belts



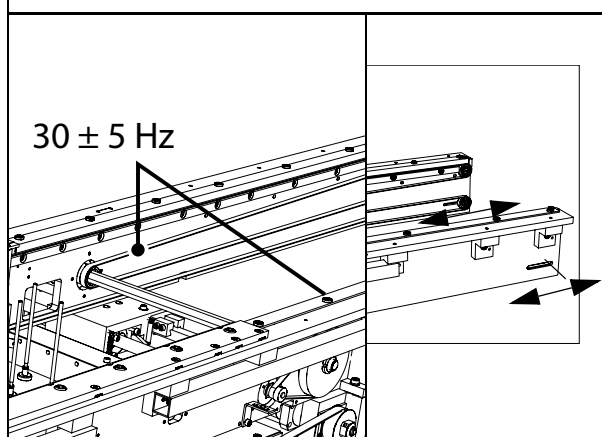
2. Adjust transport belts in run-in area

- Release lower left bearing wheel on rail.
- Apply lateral pressure to the bearing wheel to increase or decrease belt tension as required.
260 ± 40 Hz
- Secure bearing wheel and re-check belt tension.



3. Adjust transport belts in work area

- Release lower right bearing wheel on rail.
- Apply lateral pressure to the bearing wheel to increase or decrease belt tension as required.
30 ± 5 Hz
- Secure bearing wheel and re-check belt tension.



C6-00007.fm

C6.9 Transport rails, parallelism adjustment

Estimated time to complete [min.]: 20

Required special tools. Gauge board transport, [A8.6.6 Recommended Assembléon tools](#)

Required part(s) -

1. Prerequisites

- Release the transport width brake, see [C6.1 Transport, release width or lift brake manually](#)

2. Position dial gauge with support

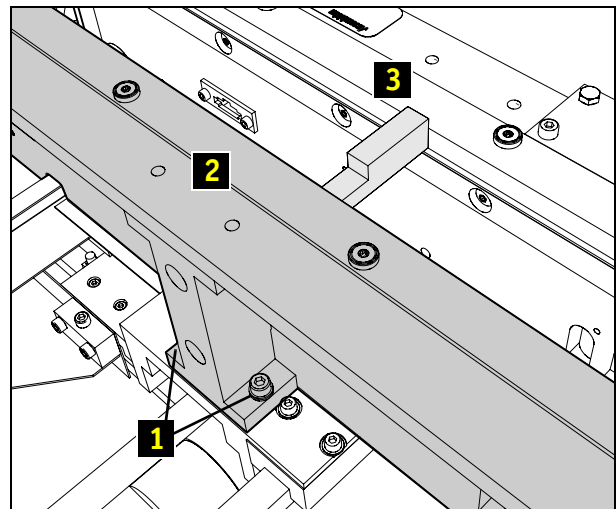
- To be defined.

3. Adjustment

- Move the rear transport rail (2) against the front transport rail.
- Loosen the four screws (1) screws of the rear transport rail.
- Place the gauge board transport blocks (3, $49 \pm 0.1\text{mm}$) above the spindles.
- Push the rear transport rail (2) against the adjustment blocks (3).
- Tighten the screws (1) of the rear transport rail.
- Remove the adjustment blocks (3).

4. Check

- Check the transport width over the whole transport area. Tolerance is 0.1 mm.
- Check height adjustment.



C6.10 Board sensors, adjustment

Estimated time to complete [min.]: 20 (for 5 sensors)

Required special tools: Mirror

Required part(s) -



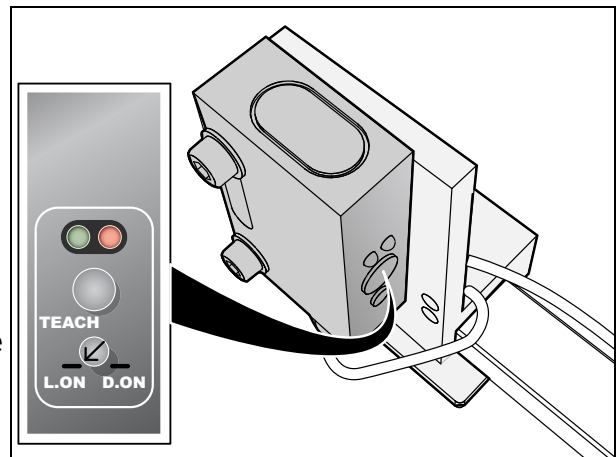
NOTE: Board sensors are easily damaged by the support plate during removal.
Do not allow the plate to come into contact with the sensors.

1. Disconnect the board sensor

- Disconnect board sensor and take it from the sliding rail.

2. Teach-in board sensor

- Select 'L.ON' as switching mode (light on) by turning the dial counter clockwise.
- Connect the board sensor to the run-in board sensor connector.
- Keep the sensor **outside the machine** and make sure that no object can be detected.
- Press 'TEACH' until the orange and green LED flash once. Release the 'TEACH' button.



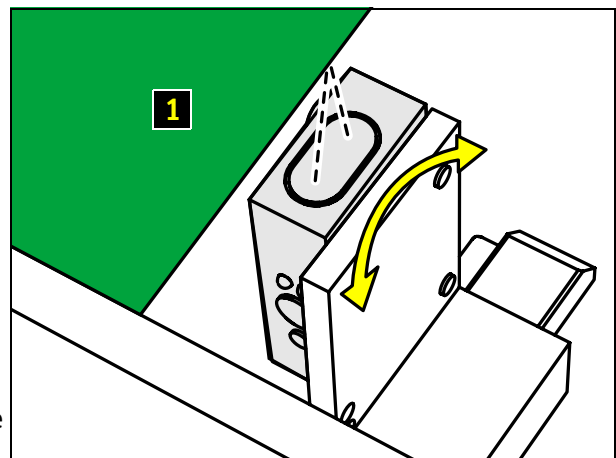
Note: The board sensor has now maximum sensitivity.
Do not let the LED flash 2 or 3 times: Switch off the sensor and re-teach.

3. Check the board sensor position

- Place the sensor back on its sliding rail and connect the cable.
- Put in a mirror (1) instead of a board.

Note: The transmitted light from the board sensor should, after reflection from the board/mirror, completely enter the receiving window.

- Use a piece of white paper to detect the reflected ray of light.



4. Adjust the board sensor position

- Loosen the Allen bolts holding the sensor on the bracket using an Allen key.
- Turn the board sensor.

Note: It may be necessary to cut the tie wraps to enable full adjustment of the sensors angle.

- Check board sensor position, see step 3.
- Secure the board sensor.
- If the tie wraps were cut in the previous step, re-apply tie wraps to fix the cables in the same position as it was fixed before.

5. Final check

- The green LED and the orange LED should both switch ON and OFF while a board passes.

Note: Green LED means board detection, yellow LED means sensor ON.

C6-00009.fm

C6.11 Lift table, adjusting the zero course EPD

Estimated time to complete [min.]: 10

Required special tools. -

Required part(s) -

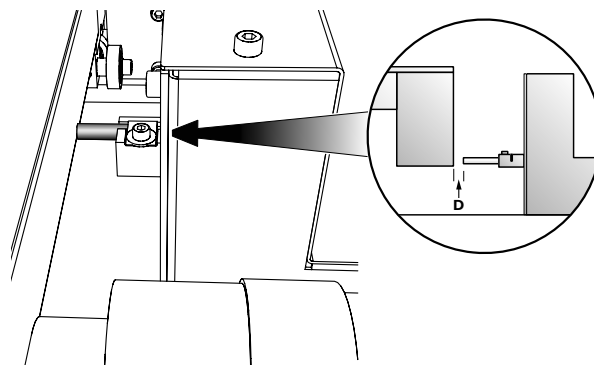
1. Zero fine adjustment

- Lower the lift until the EPD senses the lift detection plate. Use the test procedure, see [A5.1.3 TIP tools](#) .
- Read the user interface display and if the increment number is not between 500 and 1500, adjust belt-to-pulley relationship to bring the zero fine setting within limits.

2. Zero coarse adjustment

- Loosen EPD securing screw.
- Move EPD until the distance 'D' from the detection plate is 1 ± 0.5 mm.
- Tighten EPD securing screw and re-check measurement.
- Carry out zero fine adjustment.

Note: The EPD can be checked by holding metal (e.g. screwdriver) close to it.



C6.12 Transport width, parallelism adjustment

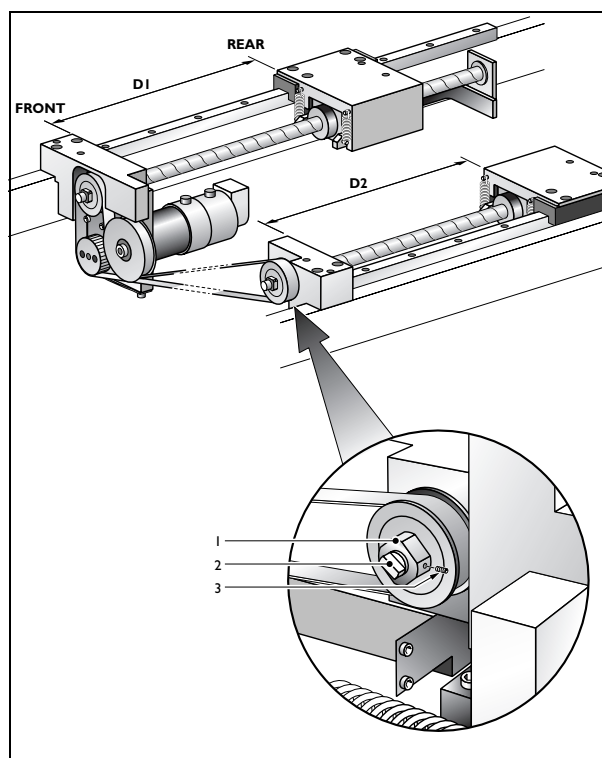
Estimated time to complete [min.]: 20
Required special tools. Feeler gauges
Required part(s)

1. Prerequisites

- Release the transport width brake, see [C6.1 Transport, release width or lift brake manually](#)

2. Adjust parallelism

- Close the distance between the front and rear width adjustment guide blocks until they are as close as possible.
- Measure the distance (with feeler gauges) between the guide blocks at 'D1' and compare it with the distance between the guide blocks at 'D2'.
- If the difference at 'D1' is not between 0.05 and 0.2 mm:
 - * Loosen grub screw (3) and locking nut (1) on the shaft.
 - * Turn the shaft (2) until the difference between 'D1' and 'D2' is between 0.05 and 0.2 mm.
 - * Tighten the locking nut, grub screw and re-check distance D1 and D2.



C6-00014.fm

C6.13 Transport direction, changing

Estimated time to complete [min.]: -
Required special tools. -
Required part(s) -

1. General

- The transport direction for production is left to right (uni-directional). The transport width is set automatically, but the support unit is provided with a manually adjustable pin grid array.

2. Change transport direction

- It is possible to change the transport direction from right to left.
- d:\user\apc\config\machine\machine.cfg (process controller)
[TRANSPORT]
DIRECTION = LEFT_RIGHT or RIGHT_LEFT
- Contact you regional service centre to change the transport direction.

C6-00015.fm

CHAPTER C7 Maintenance instructions



NOTE: Operation, adjustment, maintenance and repair of this machine shall be carried out by **qualified and trained** personnel only.

This chapter contains detailed (corrective and preventive) maintenance instructions.

The preventive maintenance intervals are defined in [A7.3 Preventive maintenance schedule](#) .

For Material Safety Data Sheets, see [A2.12 Material safety data sheets \(MSDS\)](#)

C7.1 Board sensors, cleaning

Estimated time to complete [min.]: 2

Required special tools. Ethanol, lense tissues

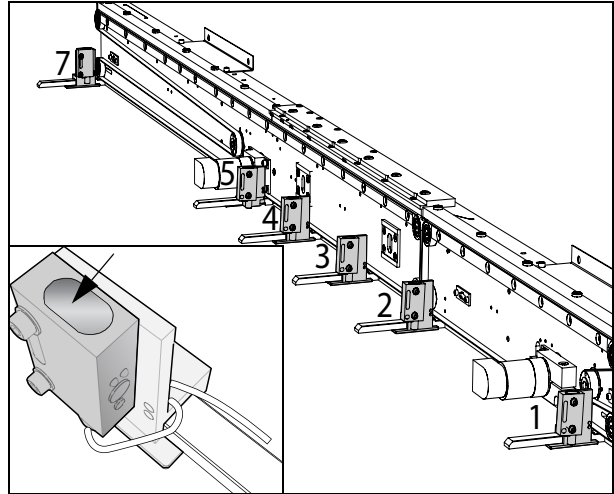
Required part(s) -

1. Prerequisites

- Remove the front trolleys.
- Power down the machine.

2. Cleaning the board sensors

- Clean the lenses of all board sensors using lense tissues.



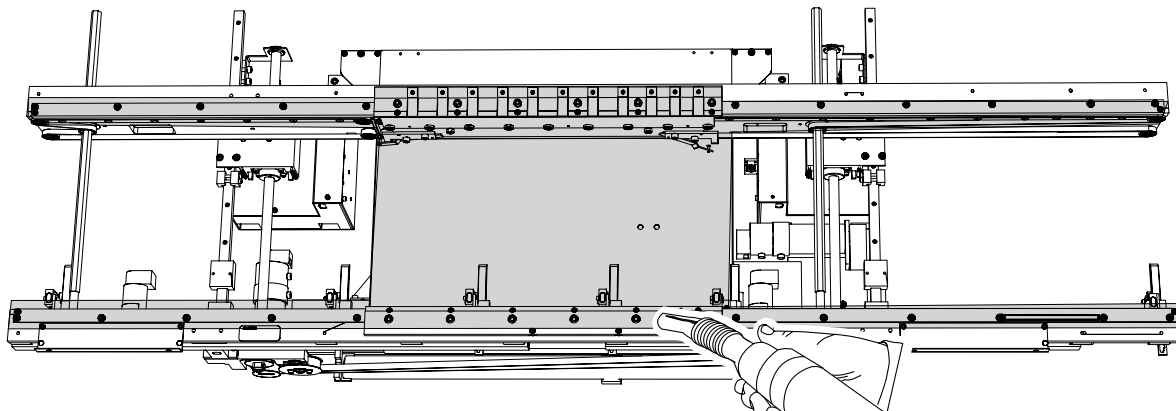
C7.2 Transport area, cleaning

Estimated time to complete [min.]: 5
Required special tools. Vacuum cleaner, fibre free tissues, ethanol
Required part(s) -

1. Prerequisites

- Remove the front trolleys.
- Power down the machine.

2. Cleaning



- Use a vacuum cleaner to remove components, rubbish and dust from the board transport area.
- Clean the transport track using fibre free tissue moistened with ethanol.

C7-00003.fm

C7.3 Transport spindles and bearings, checking and lubricating

Estimated time to complete [min.]: 30

Required special tools: -

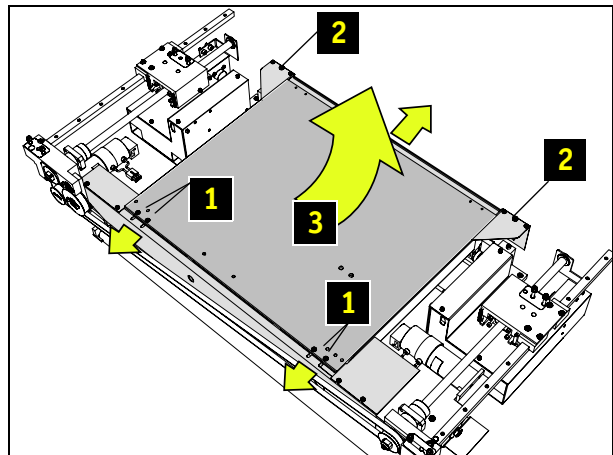
Required part(s) Grease, [A8.5.3 Maintenance kit \(PA 2440/00\)](#)

1. Prerequisites

- Set transport to minimum width.
- Set the lift table to the down position.
- Remove the front trolleys.
- Power down the machine.

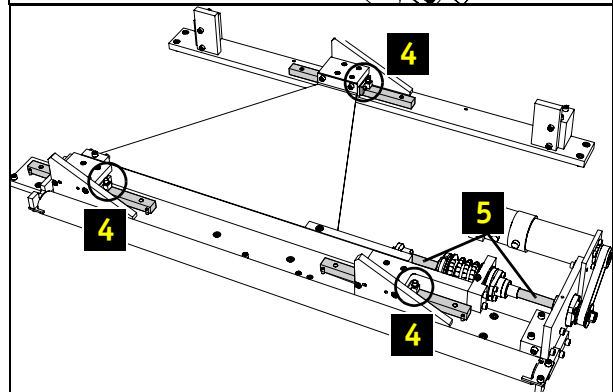
2. Remove lift table

- Loosen four screws at the front (1) and slide transport security plate to the front.
- Remove two screws (2) and take rear security plate out.
- Take out the lift table (3) by lifting it under an angle of approximately 45 degrees.



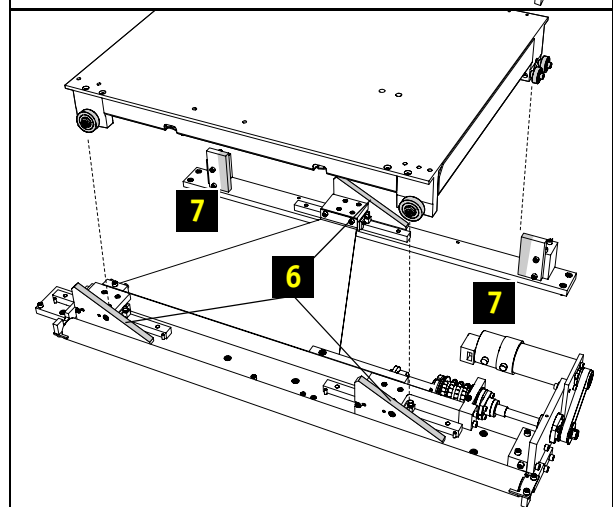
3. Lubricate the lift table

- Lubricate the linear guides (4) with Isoflex Topas NCA52.
- Grease the spindle (5) with NSK no.1



4. Check and grease the lift table

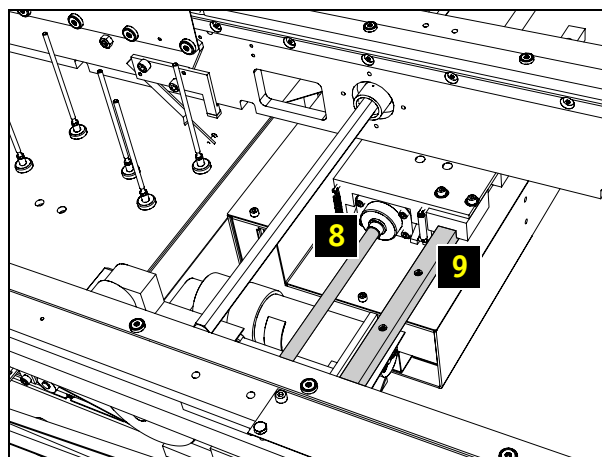
- Check the function of the bearings.
- Clean bearings, if necessary.
- Grease the cam blocks (6) and guides (7), use Anti score EP lube 3 grease.
- Install the lift table.



C7-00006.fm

5. Grease the board width adjustment

- Grease the spindles (8) left and right, use NSK no.1
- Grease the guides (9) left and right, use Isoflex Topas NCA52.



C7-000006.fm

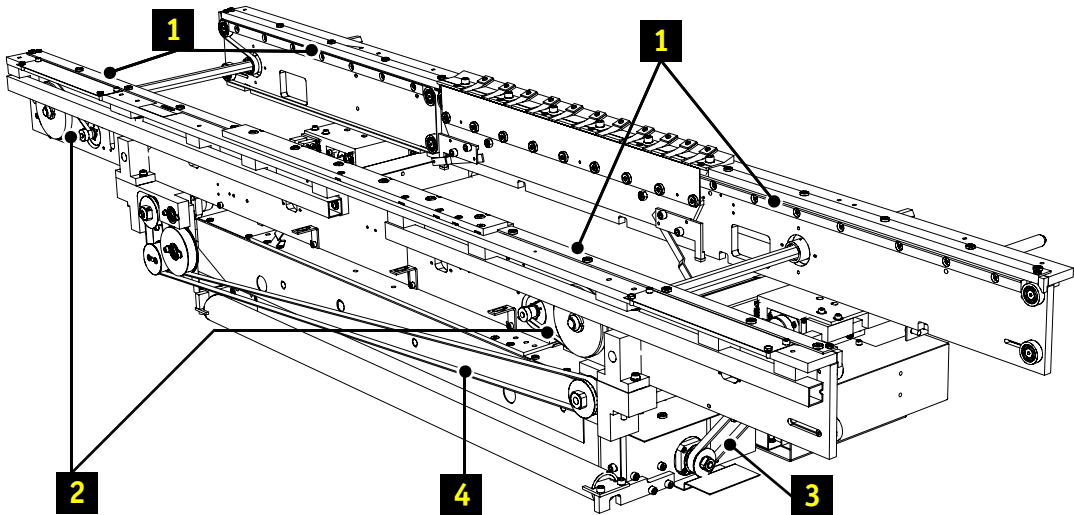
C7.4 Transport belts, checking

Estimated time to complete [min.]: 10
Required special tools. Belt tension indicator,
see [A8.6.6 Recommended Assembléon tools](#)
Required part(s) -

1. Prerequisites

- Remove the front trolleys.
- Power down the machine.

2. Checking the belts



- Check the transport belts for tension and damage, replace them where necessary.

Belt	Check belt tension	Replacement
1	C6.8. Transport belts, check/adjust tension	C8.3 Transport belts, replacement
2	C6.3. Transport drive belt, check/adjust tension	C8.2 Transport drive belts, replacement
3	C6.4. Transport lift belt, check/adjust tension	C8.7 Transport lift belt, replacement
4	C6.2. Transport width belt, check/adjust tension	C8.17 Transport width belt, replacement

Note: Check the bearings when replacing a belt.

C7-00005.fm

CHAPTER C8 Installation and replacement instructions

C8.1 Transport and transport modules, repair policy

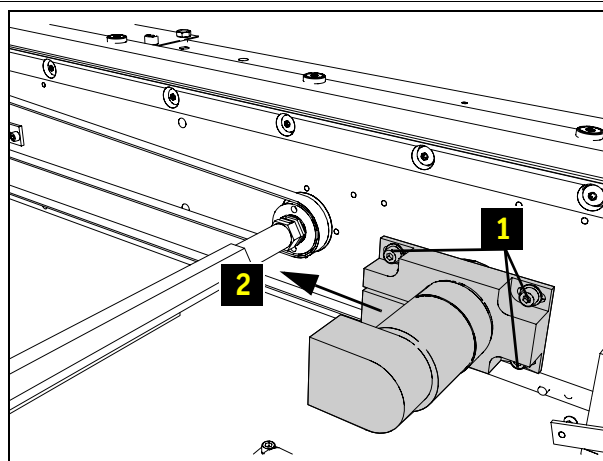
C8-00018.fm

C8.2 Transport drive belts, replacement

Estimated time to complete [min.]: 30 (sub tasks included)
 Required special tools. Belt tension gauge, see [A8.6.5 Recommended special tools](#)
 Required part(s) [A8.4.7 Board transport, spares](#)

1. Remove the transport drive belt

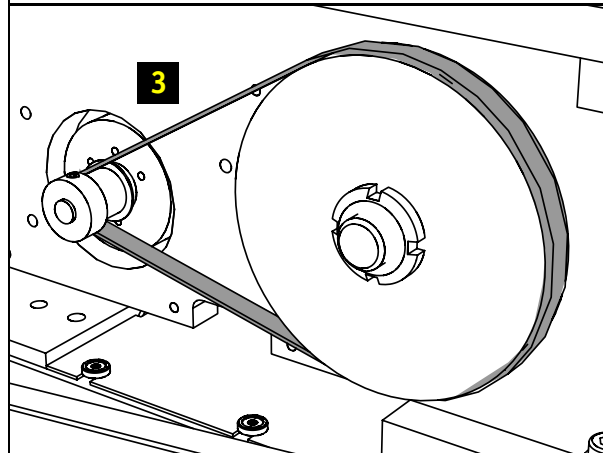
- Loosen the three bolts (1).
- Slacken the board transport drive belt tension by sliding the motor bracket (2).
- Remove the drive belt (3).



2. Install the transport drive belt

3. Finalize

- Adjust the belt tension, [C6.3 Transport drive belt, check/adjust tension](#)



C8.3 Transport belts, replacement

Estimated time to complete [min.]:	20 (sub tasks included)
Required special tools.	Belt tension gauge, see A8.6.5 Recommended special tools
Required part(s)	A8.4.7 Board transport, spares

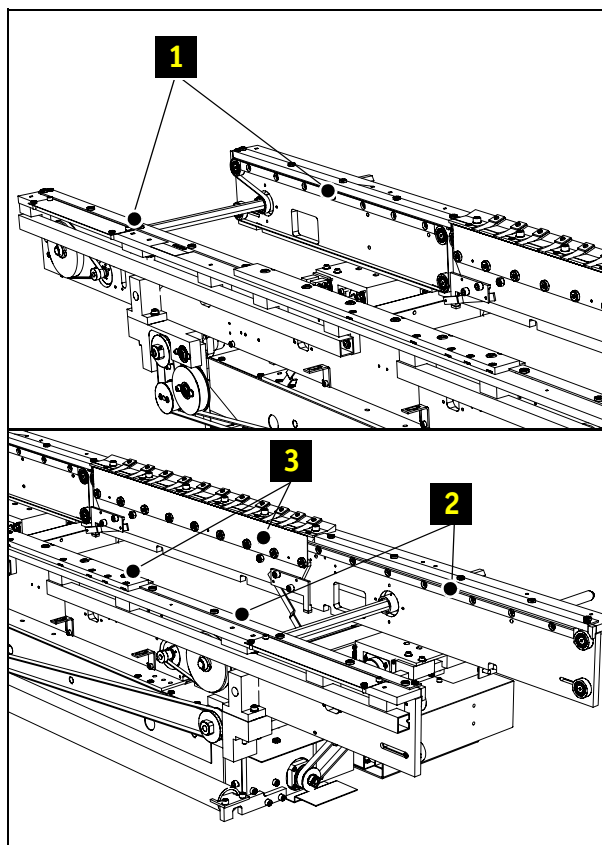
1. Replacing the transport belts in the run-in area (1)

Note: Run-in belts can be replaced without disassembling any part.

- Adjust and check belt tension, see [C6.8 Transport belts, check/adjust tension](#) .

2. Replacing the transport belts in the work area (2)

- Remove the board clamps (3).
- Replace the transport belts.
- Adjust and check the belt tension, see [C6.8 Transport belts, check/adjust tension](#)
- Adjust the board clamps, see [C6.7 Board clamps, adjustment](#) .



C8-00017.fm

C8.4 Transport drive belt motors, replacement

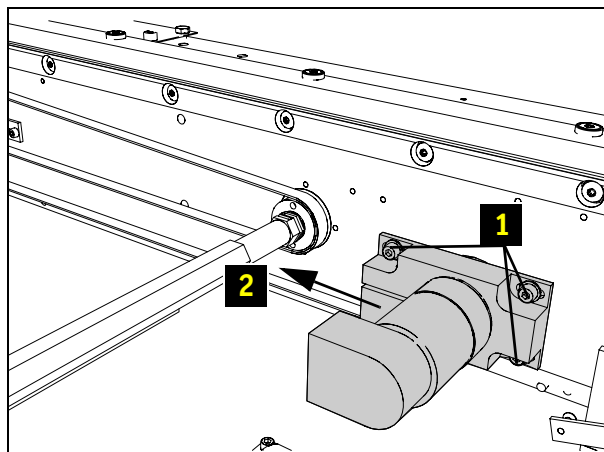
Estimated time to complete [min.]: 40 (sub tasks included)

Required special tools.

Required part(s) [A8.4.7 Board transport, spares](#)

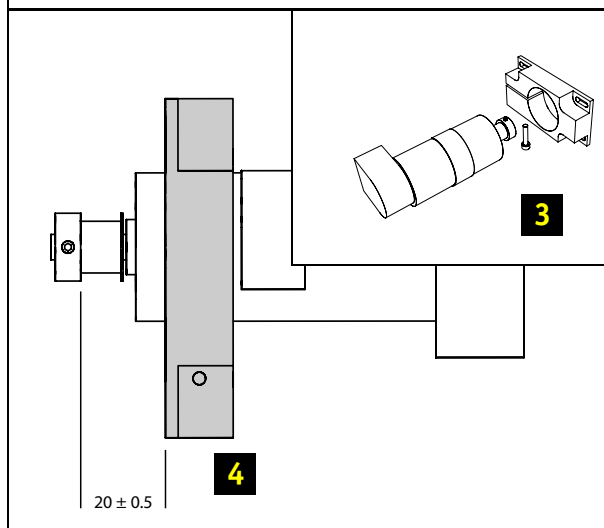
1. Remove transport drive belt motor

- Loosen the three screws (1) and slide the motor with bracket (2) to release the belt tension.
- Remove drive belt from gear wheel.
- Release connector and take transport drive belt motor out.



2. Transfer bracket

- Loosen clamping screw and slide motor out.
- Place new motor in the bracket.
- Check distance (4), 20 mm.
- Tighten clamping screw.
- Verify the distance.



3. Install the transport drive belt motor

- Install the transport drive belt motor in reverse order.
- Mount the transport drive belt, see [C8.2 Transport drive belts, replacement](#)

C8-00004.fm

C8.5 Transport coupling, replacement

Estimated time to complete [min.]: 10

Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

1. Prerequisites

- Set the transport to the maximum width position.

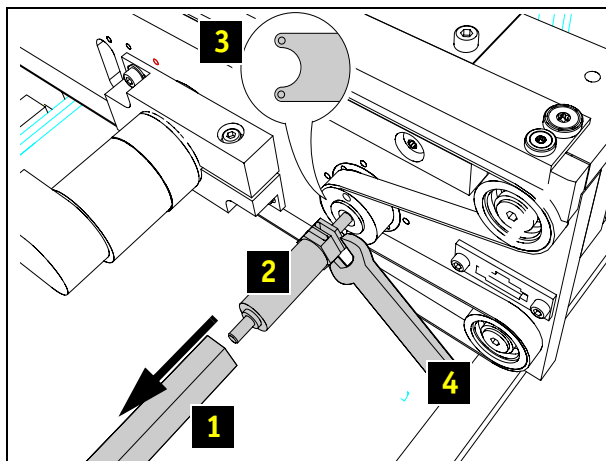
2. Dismantling

- Loosen the axis (1) and slide it through the rear beam.
- Loosen and remove the coupling (2).
Use a special key (3) in combination with an open end spanner (4).

Note: Place the open end spanner (4) as close to the pulley when mounting, to avoid damage of the coupling.

3. Assembly

- Assemble the transport coupling in the reverse order of removal.



C8-00001.fm

C8.6 Board sensor, replacement

Estimated time to complete [min.]: 10

Required special tools. -

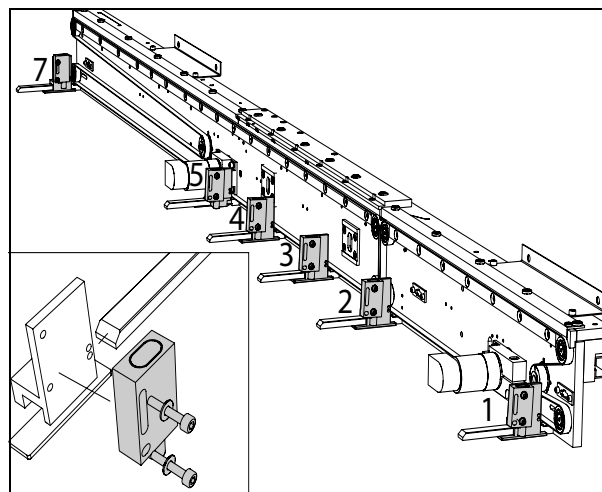
Required part(s) [A8.4.7. Board transport, spares](#)

1. Replace the board sensor

- Disconnect the cable of the concerning board sensor.
- Slide bracket off the guide.
- Install the new board sensor.

2. Finalize

- Adjust the board sensor, see [C6.10 Board sensors, adjustment](#)
- Do the board stop position calibration (see [A6.1.1 Exchange calibration procedure](#)).



C8.7 Transport lift belt, replacement

Estimated time to complete [min.]: 30

Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

1. Prerequisites

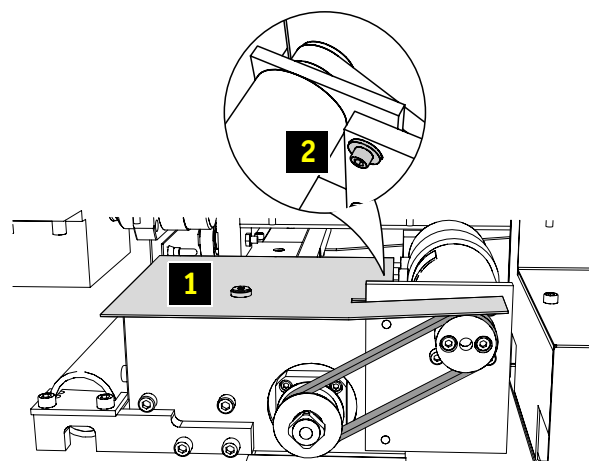
- Set transport to maximum width.
- Set lift table in up position.
- Power down machine.

2. Replace transport lift belt

- Remove the cover plate (1).
- Slacken belt tension (2).
- Replace transport lift belt.

3. Finalize

- Adjust and check the transport lift belt tension, see [C6.4 Transport lift belt, check/adjust tension](#)
- Adjust zero course and zero fine, see [A5.1.3 TIP tools](#)



C8-00006.fm

C8.8 Transport lift motor, replacement

Estimated time to complete [min.]: 45

Required special tools. -

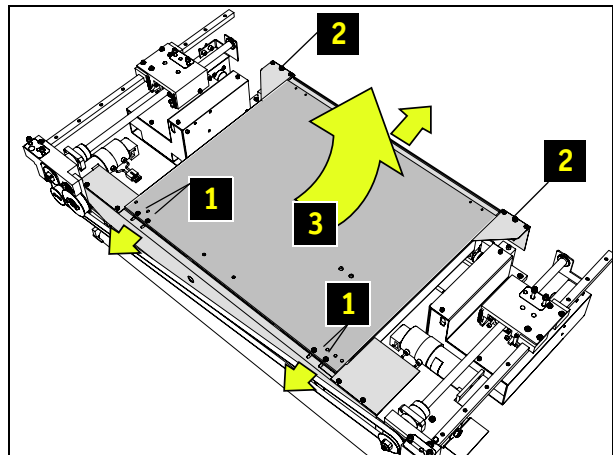
Required part(s) [A8.4.7. Board transport, spares](#)

1. Prerequisites

- Set transport to minimum width.
- Set the lift table to the down position.
- Shutdown and switch off the system.

2. Remove lift table

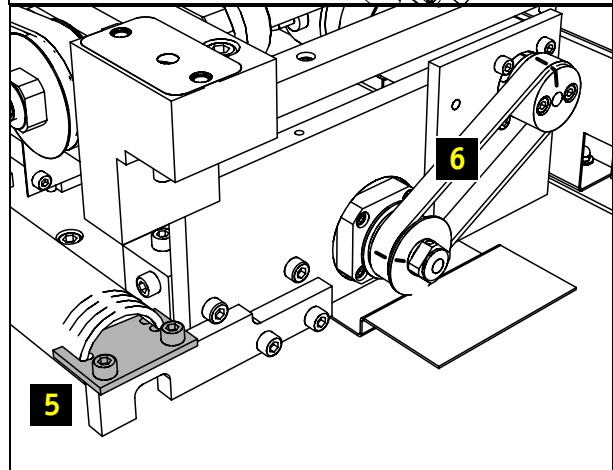
- Loosen four screws at the front (1) and slide transport security plate to the front.
- Remove two screws (2) and take rear security plate out.
- Take out the lift table (3) by lifting it under an angle of approximately 45 degrees.
- Release transport lift brake, see [C6.1 Transport, release width or lift brake manually](#)



3. Release spring

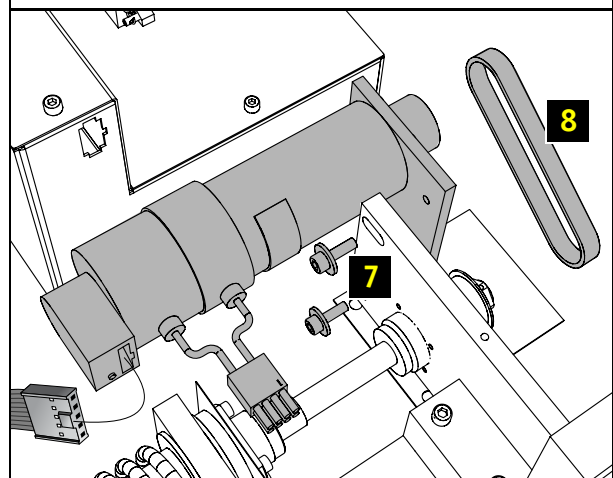
CAUTION: The spring is under tension!

- Release the spring by removing bracket (5). Hold spring firmly while loosening the bolts.
- Mark the position of the timing belt on both the gear wheel and timing belt.



4. Remove the transport lift motor

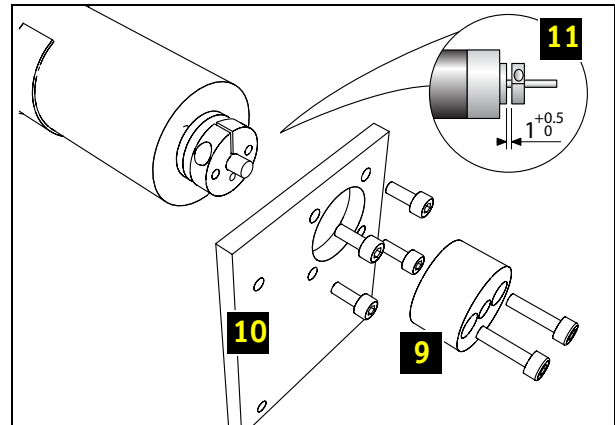
- Loosen the 2 bolts (7) of the transport lift motor.
- Disconnect connectors.
- Remove the timing belt (8) and take out the transport lift motor.



C8-00010.fm

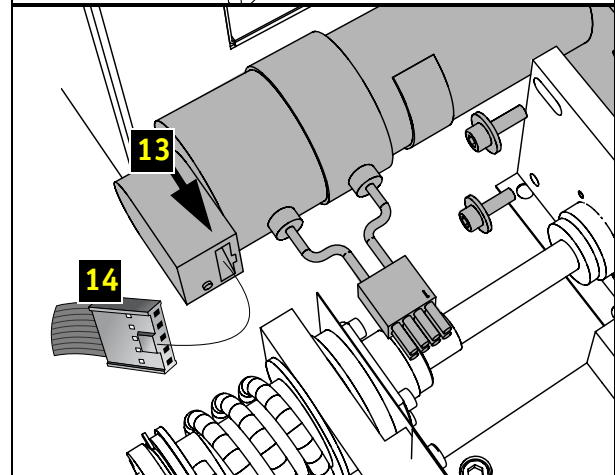
5. Transfer bracket of the motor

- Remove the gear (9).
- Remove the bracket (10).
- Check shaft clamp (11) position, if not OK see [C8.14 Shaft clamp on transport width and lift motor, replacement](#)
- Mount the bracket (10).
- Mount gear (9).



6. Finalize

- Mount the transport lift motor in reverse order.
- Check encoder is facing to the front of the machine (13).
- Mount the encoder cable (14) with the cam facing the motor.
- Mount the transport lift belt on the previous marked position.
- Adjust the belt tension, see [C6.4 Transport lift belt, check/adjust tension](#)
- Check zero fine/zero coarse adjustment, see [C6.11 Lift table, adjusting the zero course EPD](#).
- Calibrate the lift position via low level transport calibration ([A6.1.1 Exchange calibration procedure](#)).



C8.9 Transport lift table, linear guides replacement

Estimated time to complete [min.]: 60

Required special tools. Gauge board transport,
A8.6.6 Recommended Assembléon tools

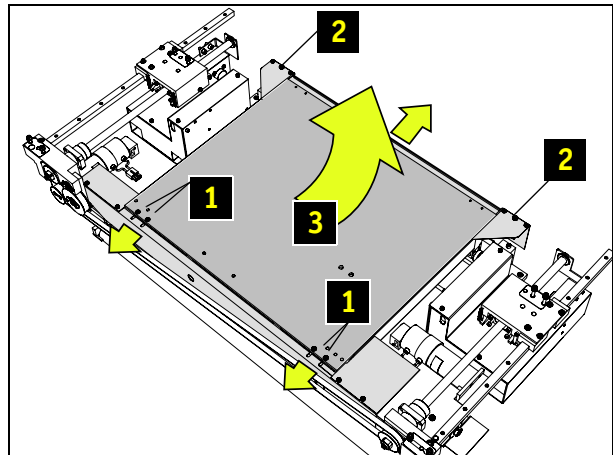
Required part(s) A8.4.7. Board transport, spares

1. Prerequisites

- Set transport to maximum width.
- Set the lift table to the down position.
- Shutdown and switch off the system.

2. Remove lift table

- Loosen four screws at the front (1) and slide transport security plate to the front.
- Remove two screws (2) and take rear security plate out.
- Take out the lift table (3) by lifting it under an angle of approximately 45 degrees.
- Release transport lift brake, see [C6.1 Transport, release width or lift brake manually](#)

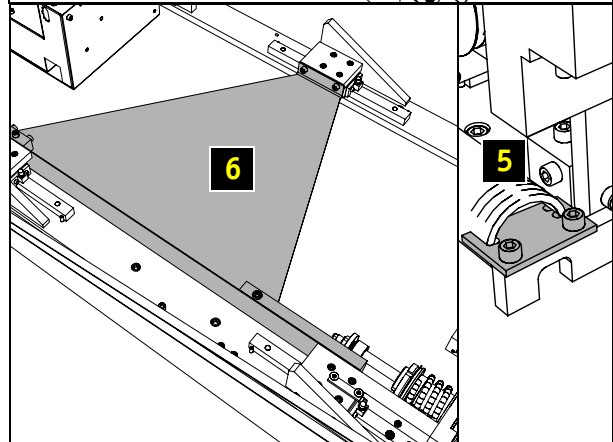


3. Release spring

- Release the spring by removing bracket (5). Hold spring firmly while loosening the bolts.

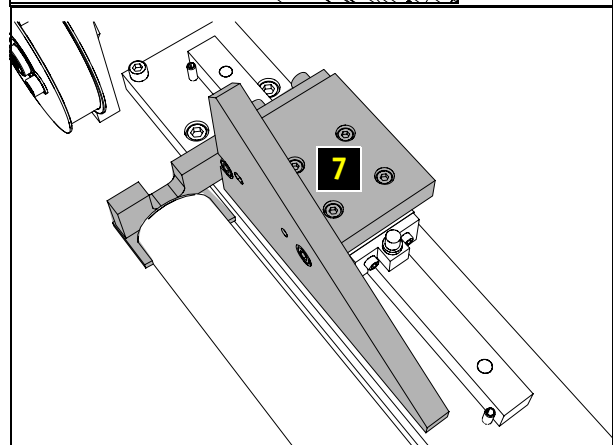
CAUTION: The spring is under tension!

- Remove the triangle plate (6).



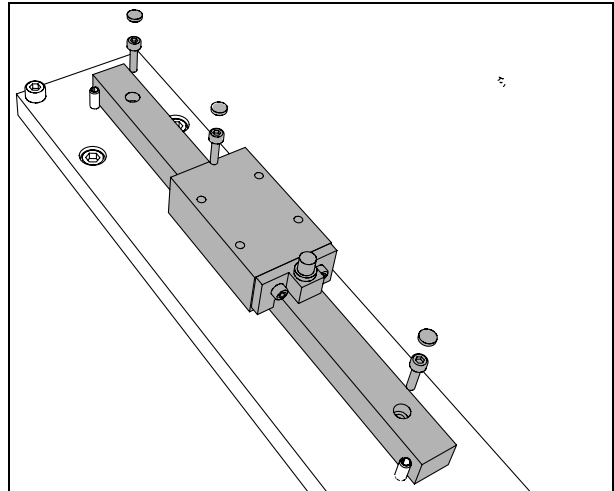
4. Remove the cam blocks

- Loosen the four screws of the three cam blocks (7).



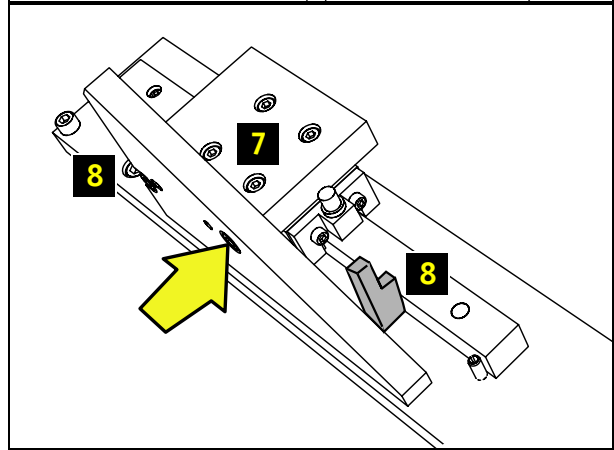
C8-00008.fm

5. Replace the linear guides



6. Mount/adjust the cam blocks

- For each cam block:
 - * Insert the gauge board transport (8) at both sides of the linear guide.
 - * Apply hand pressure to the cam block until the distance blocks are both tightly held and the cam block is parallel to the linear guide.
 - * Tighten the four screws of the cam block.



7. Finalize

- Install in reverse order as described above.

C8.10 Transport lift table, EPD sensor replacement

Estimated time to complete [min.]: 20

Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

1. Prerequisites

- Set transport to maximum width.
- Open electric box at the left (1).

2. Remove (zero course) EPD

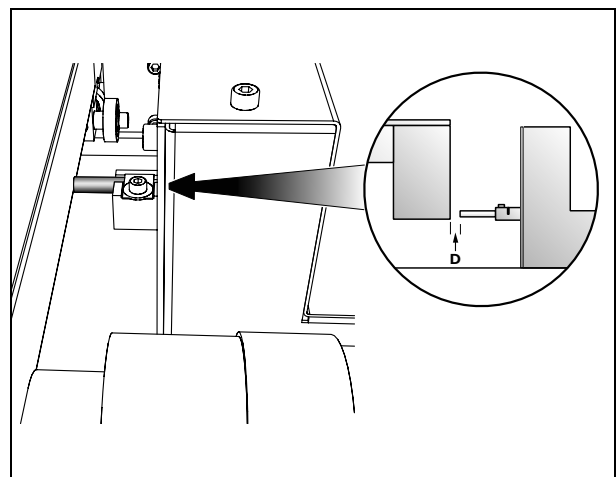
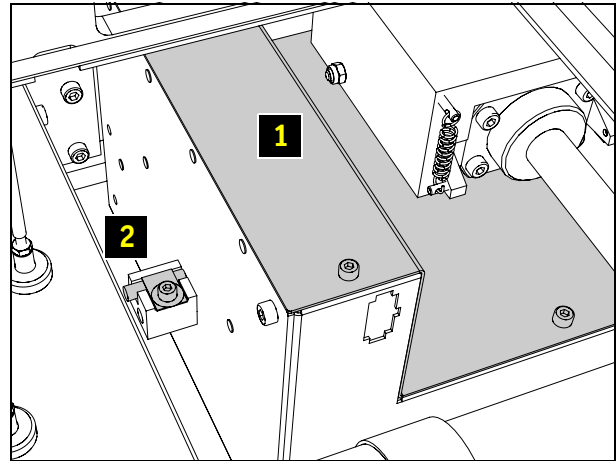
- Loosen screw.
- Pull out EPD (2).
- Disconnect wiring.

3. Install EPD

- Slide in EPD (2).
- Finger tighten the bolt.
- Connect wiring.
- Close electric box at the left (1).

4. Adjustment

- Check/adjust clearance of the lift EPD at 'D' (1 mm \pm 0.5 mm);
- Check zero fine/zero coarse adjustment, see [C6.11 Lift table, adjusting the zero course EPD](#).
- Check the lift operation via user interface or [A5.1.3 TIP tools](#).
- Calibrate the lift position via low level transport calibration, see [A6.1.1 Exchange calibration procedure](#).



C8.11 Transport lift table, bearing replacement

Estimated time to complete [min.]: 30

Required special tools. -

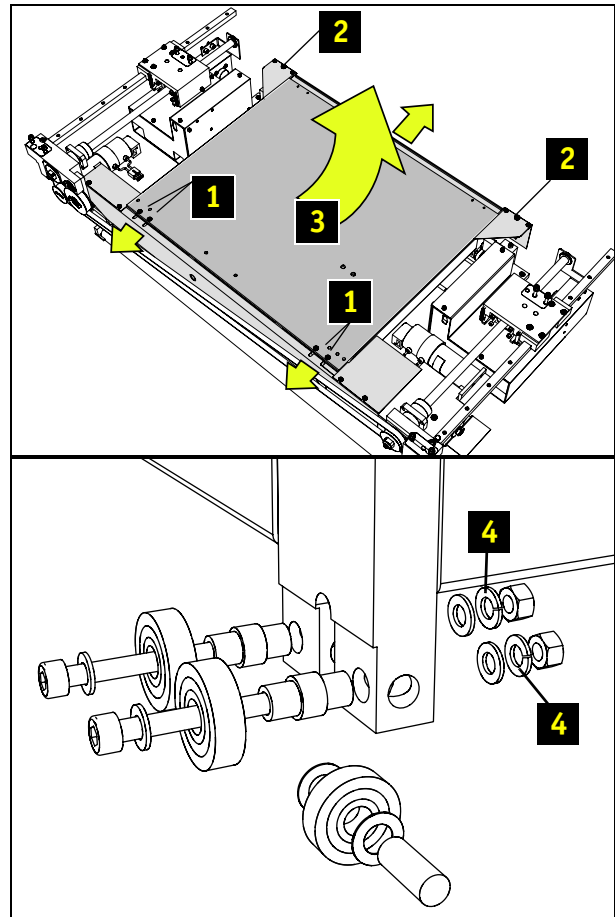
Required part(s) A8.4.7 Board transport, spares

1. Prerequisites

- Set transport to minimum width.
- Set the lift table to the down position.
- Shutdown and switch off the system.

2. Remove lift table

- Loosen four screws at the front (1) and slide transport security plate to the front.
- Remove two screws (2) and take rear security plate out.
- Take out the lift table (3) by lifting it under an angle of approximately 45 degrees.
- Release transport lift brake, see [C6.1 Transport, release width or lift brake manually](#)



3. Replace the bearings

- Make sure to mount the parts in the right sequence.
- If not mounted before: Add spring washers (4).

4. Finalize

- Adjust the lift table, see [C6.5 Transport lift table, parallelism adjustment](#) .

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C8.12 Transport lift table, eccentric bearing replacement

Estimated time to complete [min.]: 30

Required special tools. -

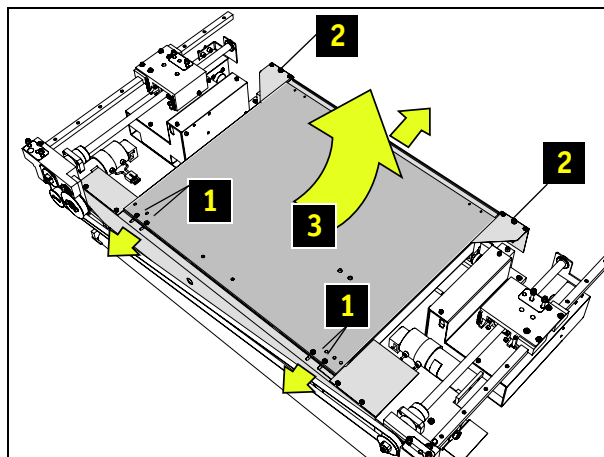
Required part(s) [A8.4.7 Board transport, spares](#)

1. Prerequisites

- Set transport to maximum width.
- Set the lift table to the down position.
- Shutdown and switch off the system.

2. Remove lift table

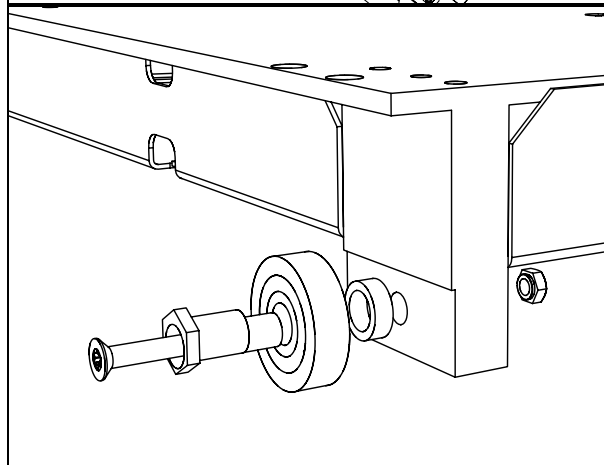
- Loosen four screws at the front (1) and slide transport security plate to the front.
- Remove two screws (2) and take rear security plate out.
- Take out the lift table (3) by lifting it under an angle of approximately 45 degrees.
- Release transport lift brake, see [C6.1 Transport, release width or lift brake manually](#)



3. Replace the bearings

4. Finalize

- Assembly in reverse order
- Adjust the lift table, see [C6.6 Transport lift table, levelling](#) .



C8.13 Transport width, dowel replacement

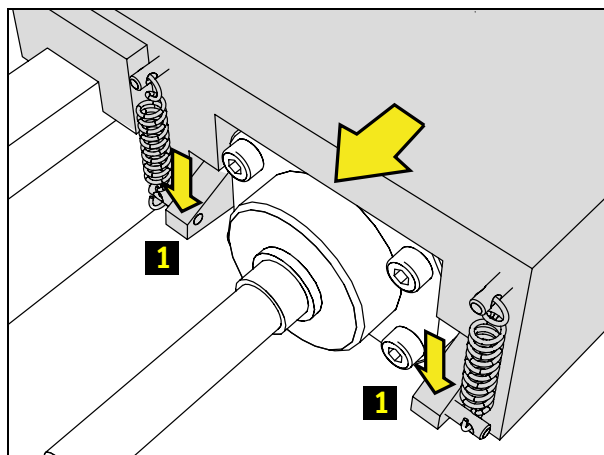
Estimated time to complete [min.]: 30

Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

1. Prerequisites

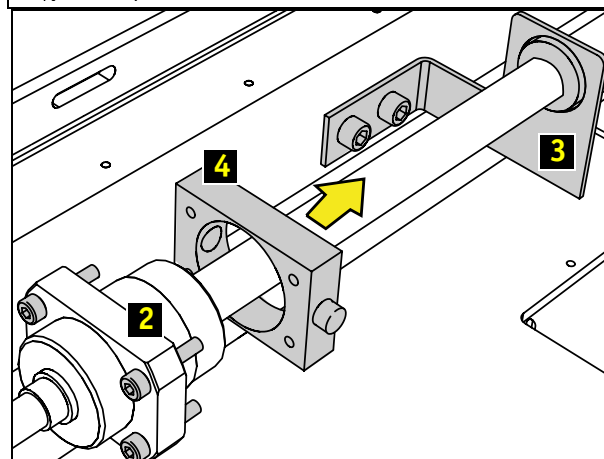
- Put the transport in the widest position.
- Push both levers (1) downwards, and slightly pull the rear beam towards the front beam.
- Nut will come out at the rear side.



2. Remove bracket

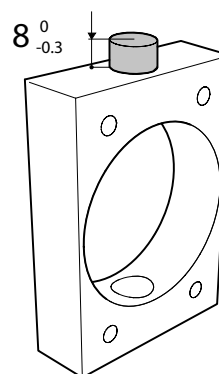
- Loosen and remove the four screws (2) that hold the bracket (4).
- Remove the axis support plate (3) and take out the bracket (4).

Note: Do not rotate the spindle nuts, or count the rotations left and right.
This prevents re-adjusting of the rear beam.



3. Replace dowels

- Remove the dowels with a punch and hammer.
- Press in the new dowels according picture.
Apply Loctite 603.



4. finalize

- Assemble in reverse order.
- If the spindle nuts are not rotated, the parallelism adjustment of the rear beam should still be OK.
- Check parallelism., see [C6.9 Transport rails, parallelism adjustment](#).
- If not OK: Try to correct by rotating one of the spindle nuts.

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C8.14 Shaft clamp on transport width and lift motor, replacement

Estimated time to complete [min.]: -

Required special tools.

Required part(s) A8.4.7 Board transport, spares

1. Prerequisites

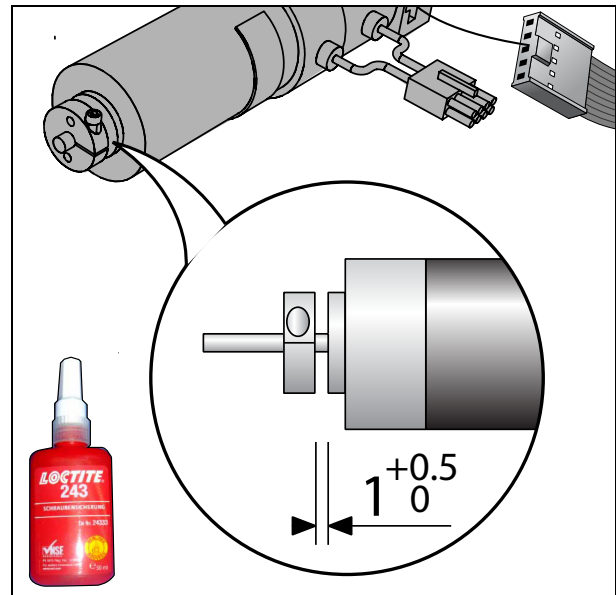
- Remove specific motor, see:
 - * [C8.8 Transport lift motor, replacement](#) or
 - * [C8.16 Transport width motor, replacement](#)

2. Replace shaft clamp

- Remove the old clamp.
- Clean shaft.
- Mount new clamp, according picture.
- Secure shaft clamp, apply Loctite 243. Tightening torque 1.3 Nm.

3. Finalize

- Install specific motor, see:
 - * [C8.8 Transport lift motor, replacement](#) or
 - * [C8.16 Transport width motor, replacement](#) .



C8.15 Transport width, tension spring replacement

Estimated time to complete [min.]: 10

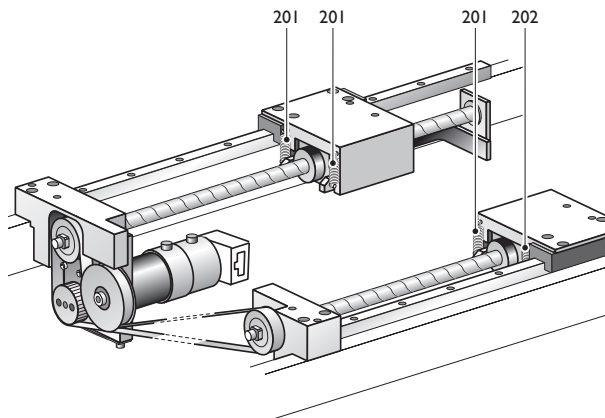
Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

1. Remove the tension springs

- Install tension spring 201 on both sides of the left guide block and on the left side of the right guide block.
- Install the tension spring 202 on the right side of the right guide block.

Note: The tension spring 202 is twice the force of the other springs (201). Due to the length of the rear transport beam the force on this side of the guide block (while stopping the movement) is twice as big as on the other sides of the guide blocks.



2. Finalize

- Assemble in reverse order.
- If the spindle nuts are not rotated, the parallelism adjustment of the rear beam should still be OK.
- Check parallelism., see [C6.9 Transport rails, parallelism adjustment](#) .
- If not OK: Try to correct by rotating one of the spindle nuts.

C8.16 Transport width motor, replacement

Estimated time to complete [min.]: 60

Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

1. Prerequisites

- Mark belt position on gears and belt.
- Slacken the transport width belt, see [C8.17 Transport width belt, replacement](#)

2. Remove transport width motor

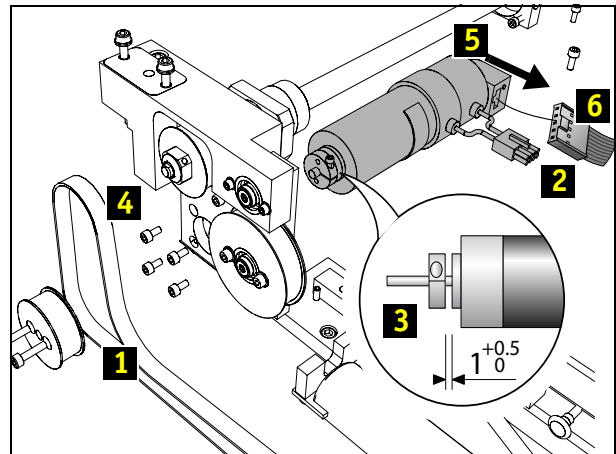
- Remove gear wheel (1).
- Disconnect motor (2)
- Remove the bolts (5) and take motor out.

3. Install transport width motor

- Check shaft clamp (3) position, if not OK see [C8.14 Shaft clamp on transport width and lift motor, replacement](#)
- Mount transport width motor according picture.

4. Finalize

- Assemble in reverse order.
- Check encoder (5) is facing to the lift.
- Mount the encoder cable with the cam (6) facing the motor.
- Check parallelism [C6.9 Transport rails, parallelism adjustment](#) .
- Adjust the transport width belt, see [C6.2 Transport width belt, check/adjust tension](#)
- Check if the zero coarse/zero fine distance is between 500 and 1500 increments. Use TIP tools, see [A5.1.3 TIP tools](#) .



C8.17 Transport width belt, replacement

Estimated time to complete [min.]: 20

Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

1. Prerequisites

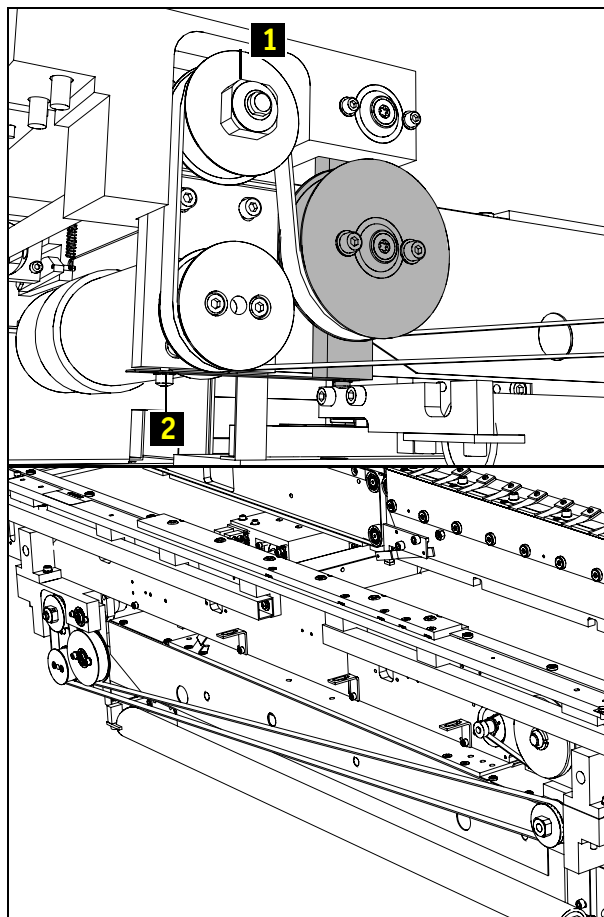
- Mark the position of both gears (1) left and right.

2. Replace the transport width belt

- Slacken transport width belt (1).
- Remove the belt.
- Check if both marked gears are still in the same position (2)
- Mount the new belt.
- Adjust the transport width belt, see [C6.2 Transport width belt, check/adjust tension](#)

3. Finalize

- Check zero fine/zero coarse adjustment.
Use Tip tools, see [A5.1.3 TIP tools](#) .
- Check parallelism of transport rails,
see [C6.9 Transport rails, parallelism adjustment](#)
and [C6.12 Transport width, parallelism adjustment](#)
- Check if the zero coarse/zero fine distance is
between 500 and 1500 increments.



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C8.18 Transport controller, replacement

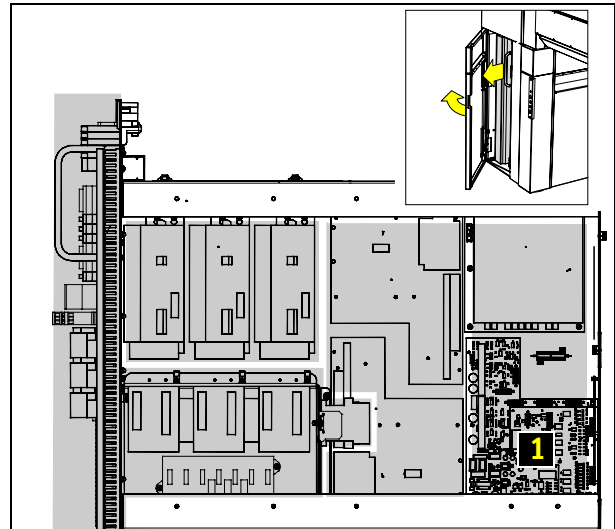
Estimated time to complete [min.]: 15

Required special tools. -

Required part(s) [A8.4.7 Board transport, spares](#)

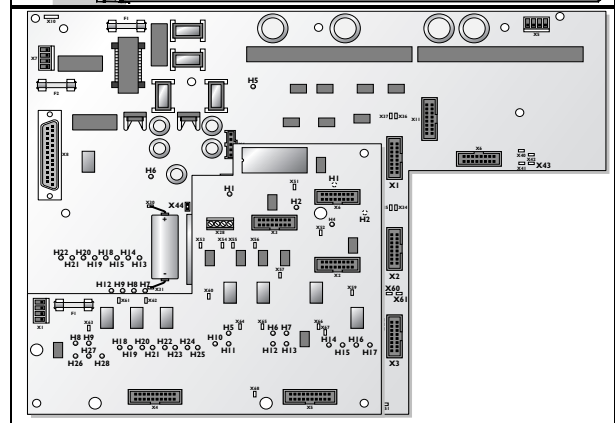
1. Prerequisites

- Switch off factory power supplies and disconnect factory power connector.
- Slide out control supply.
- Locate transport controller (1).



2. Remove the transport controller

- Use a board dismantling tool to remove the board from the clips.
- Note jumper X44 setting.
- Identify and disconnect electrical connections.
- To avoid calibration and software down load: Transfer old EPROM to new board (remove the new one).



3. Install the transport controller

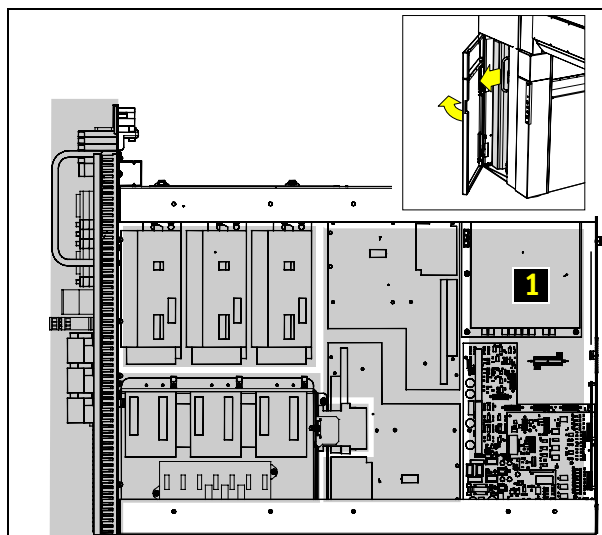
- Set Jumper X44 before installing the controller.
- Board with new EPROM: Download software and calibrate the transport accordance with [A6.1.1 Exchange calibration procedure](#) .

C8.19 Transport amplifier, replacement

Estimated time to complete [min.]: -
Required special tools. -
Required part(s) -

1. Prerequisites

- Switch off factory power supplies and disconnect factory power connector.
- Slide out control supply.
- Locate transport amplifier (1).



C8-00019.fm

D. PICK AND PLACE

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CHAPTER D1 Introduction

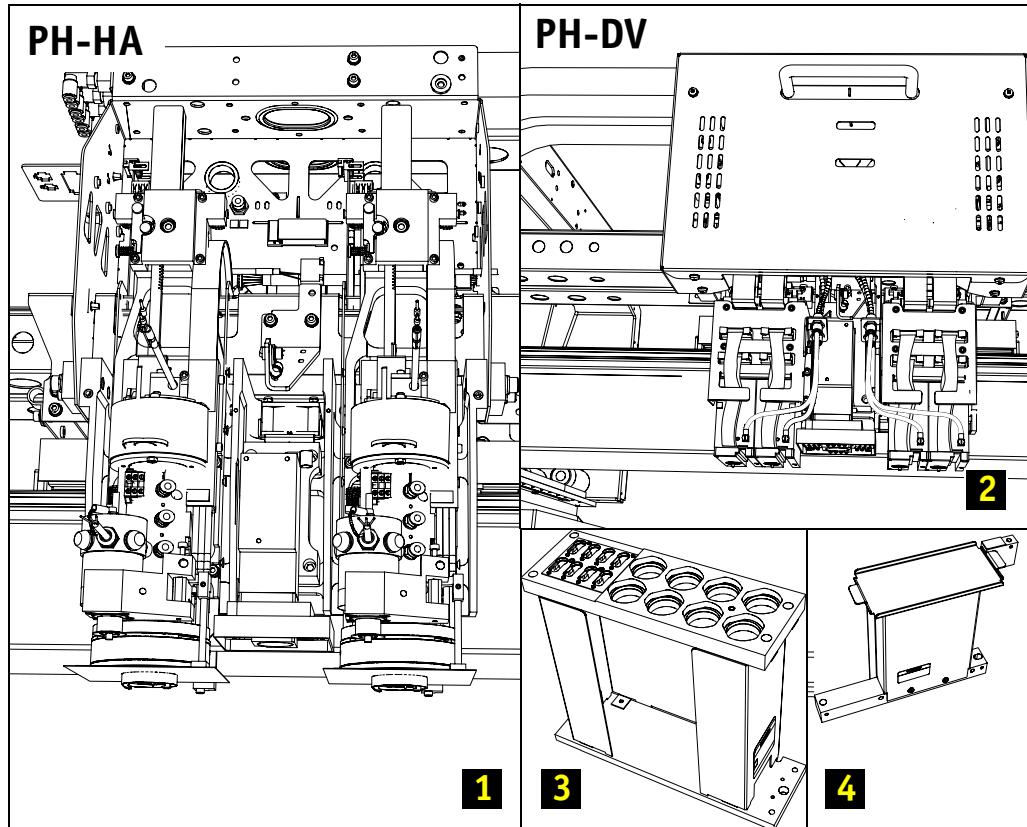


Figure 1 Overview

1. Placement heads HA, 2 heads at the rear.
2. Placement head DV, 4 heads at the front.
Main function is to pick and place components.
3. Toolbit exchange unit
Device for storage of toolbits, used by the placement heads.
4. Reuse station.
Device for valuable rejected components that can be repaired.

CHAPTER D2 Safety and ergonomics

A placement head is part of the whole machine.

Safety and ergonomics is only described for the machine as a whole.

- See [CHAPTER A2 Safety](#) .

CHAPTER D3 Technical specification

D3.1 Placement heads HA, identification

To be defined.

D3.2 Placement heads DV, identification

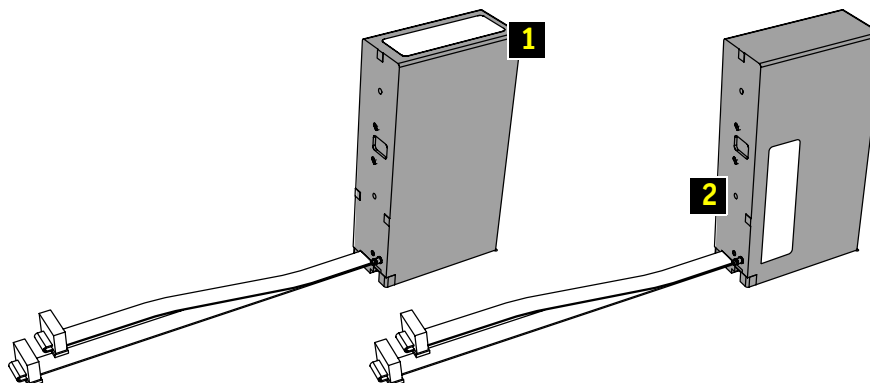


Figure 2 Placement heads DV

	1	2
Technical identification	ID sticker (1) placed on top of the placement head ID: 4022-591-054x (x = 0 - 5)	ID sticker (2) placed on the side of the placement head ID: 4022-591-0546
Commercial identification	6 digit PA number, 6 digit DC number	

D3.3 Pneumatic controllers, identification

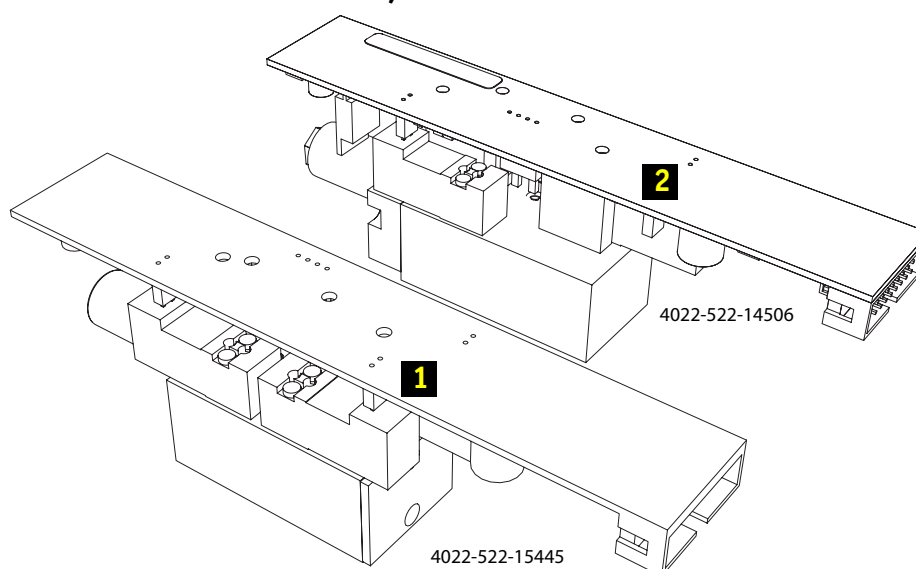


Figure 3 Pneumatic controllers

1. Pneumatic controller (3 valves), clean valve not supported by AX-201.
2. Pneumatic controller (2 valves).

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CHAPTER D4 Functional description

D4.1 Introduction

Main function of the placement heads is to pick and place SMD components. The placement heads are moved in X and Y direction via the XY robot.

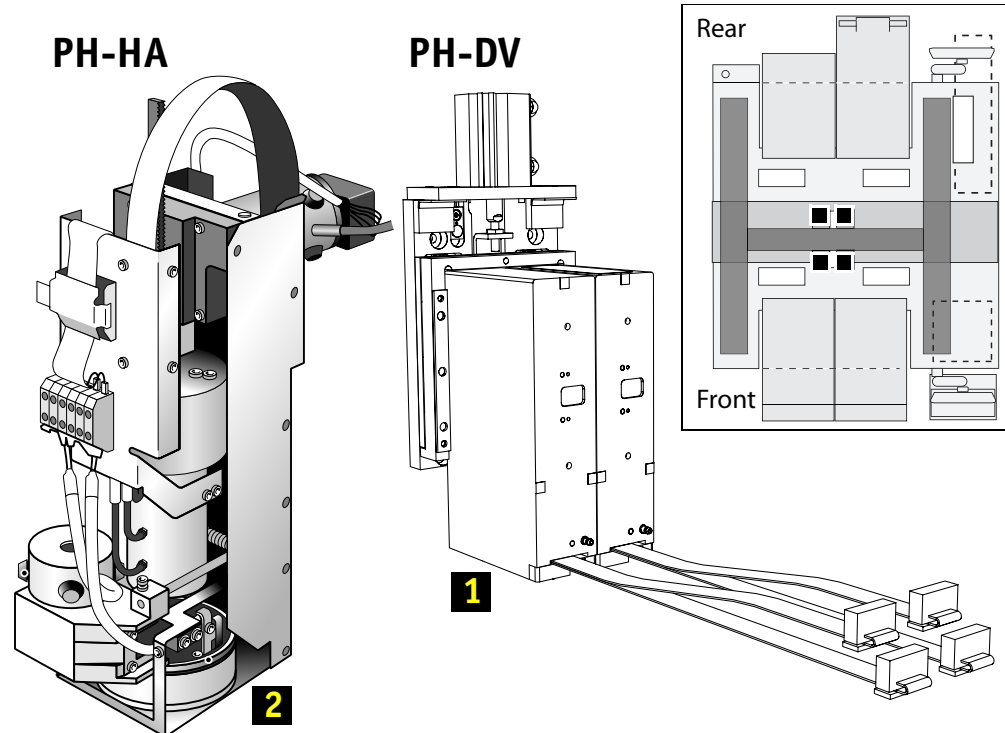


Figure 4 Pick and place

1. Placement heads DV, see [D4.2 Placement head DV](#)
2. Placement heads HA, see [D4.3 Placement head HA](#)

D4.2 Placement head DV

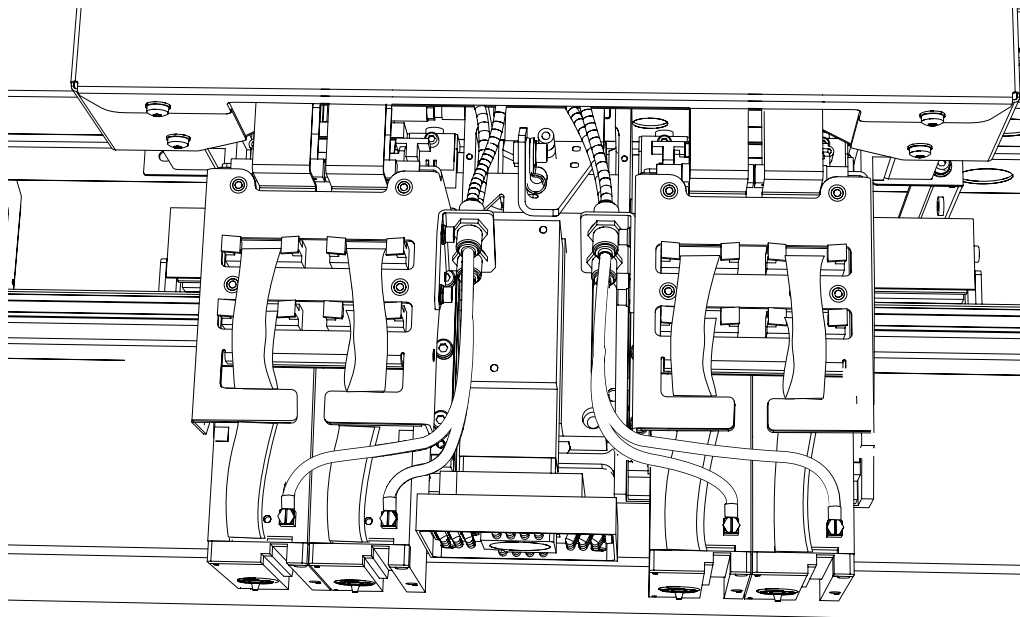


Figure 5 Placement head DV, overview

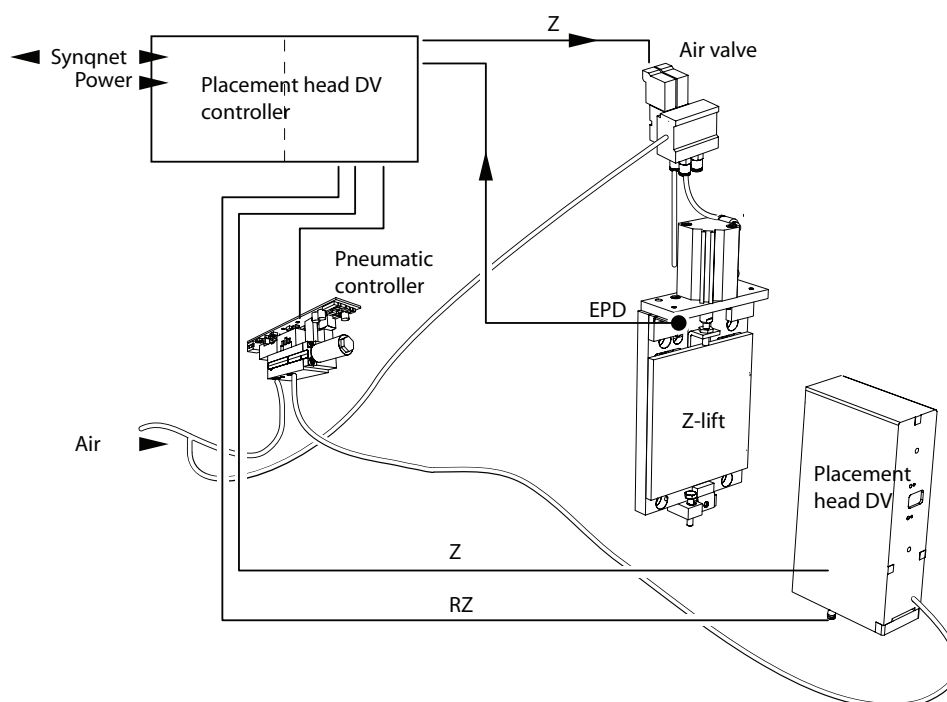


Figure 6 Placement head DV

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D4.2.1 Placement head DV

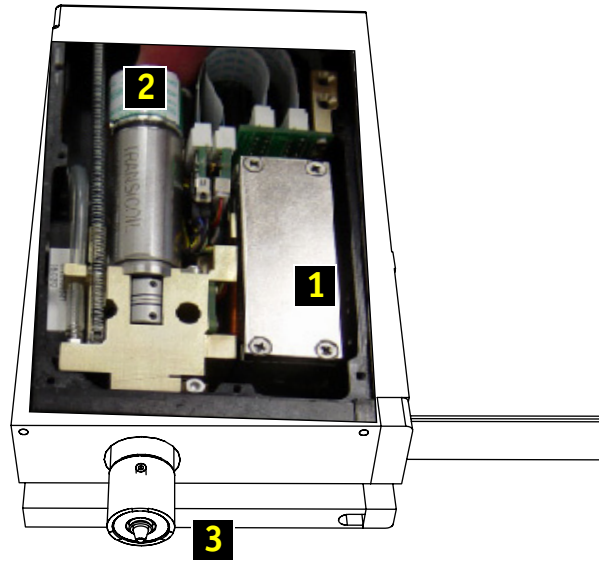


Figure 7 Placement head DV

Functions:

- Linear motor (1) (Z), is capable to pick-up and place components with a programmable placement force.
- Rotation (RZ), servo controlled, direct driven (2).
- The Z shaft is equipped with a magnetic interface (3) for easy attachment of toolbits.

Vacuum or blower air pressure comes from the pneumatic controller.

Calibration data is stored in the memory of the placement head itself.

D4.2.2 Z-lift

To avoid collision of the placement head DV with mounted components, they are lifted by the Z-lift (see Figure 6). The cylinder of the Z-lift is operated by an air valve. This air valve is controlled by the placement head DV controller . The upper position of the Z-lift is detected by an EPD.

D4.2.3 Pneumatic controller

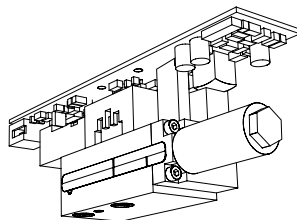


Figure 8 Pneumatic controller

The pneumatic controller performs the following functions:

- Generating vacuum for the placement head DV.
- Controlling the vacuum flow to the toolbit by switching it on and off.
- Monitoring the vacuum flow to the toolbit by calibrating and measuring.
- Controlling the compressed air flow to the toolbit by switching it on and off.

The vacuum flow is used to pick-up a component with the toolbit.

The compressed air is used for the blow-off function of the placement head.

D4.2.4 Toolbits DV

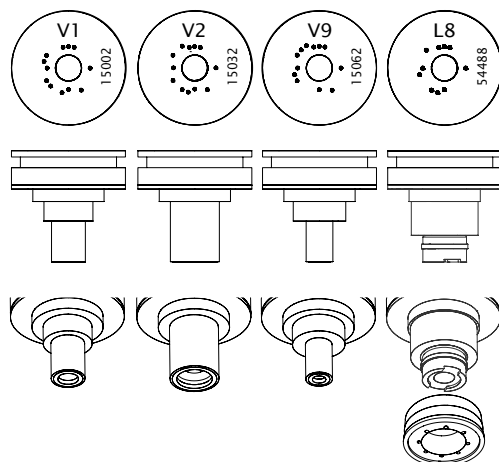


Figure 9 Toolbits survey

A toolbit has a filter and a filter pocket inside.

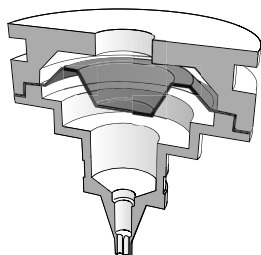


Figure 10 Cross section view of a toolbit

D4.3 Placement head HA

D4.3.1 Placement head HA, functional description

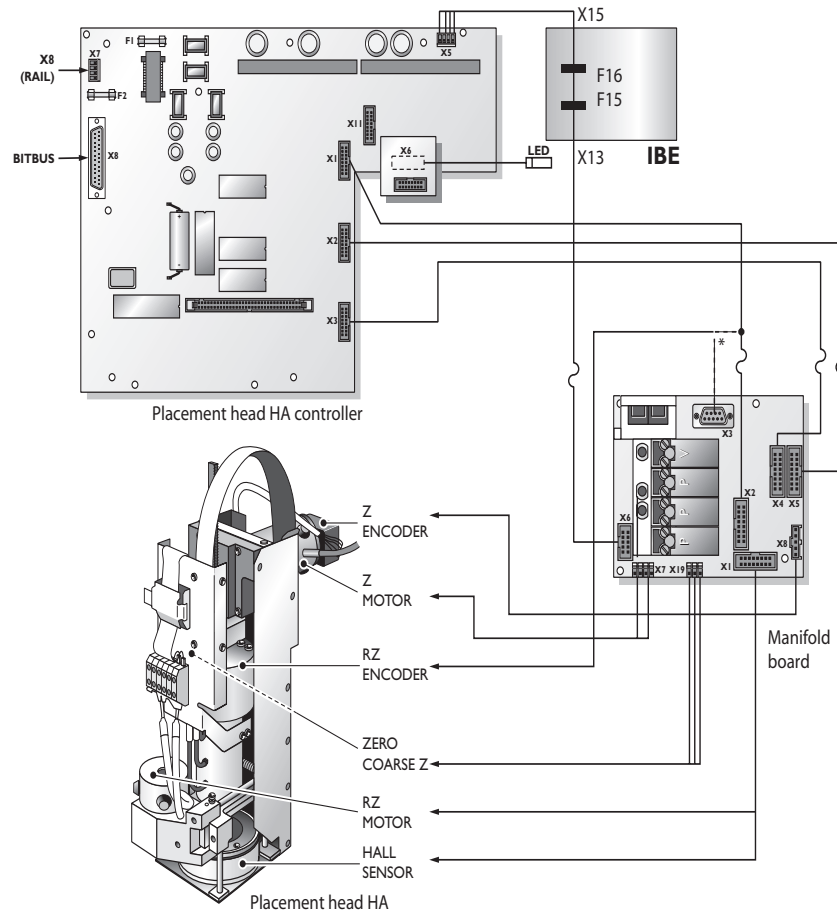


Figure 11 Placement heads HA

The placement head HA controller controls all electrical actuations of the placement head HA via the manifold board. Each controller is responsible for Z and RZ movement and positioning, Z-force, nozzle exchange, actuators and sensors. Pick and place actions are initiated by the process controller, and send to the placement head HA controller via bitbus communication.

The placement head HA controller generates a Z-force by compressing the spring in the Force Control Unit over a desired distance. The Z displacement is measured by a Hall sensor.

D4.3.2 Manifold board

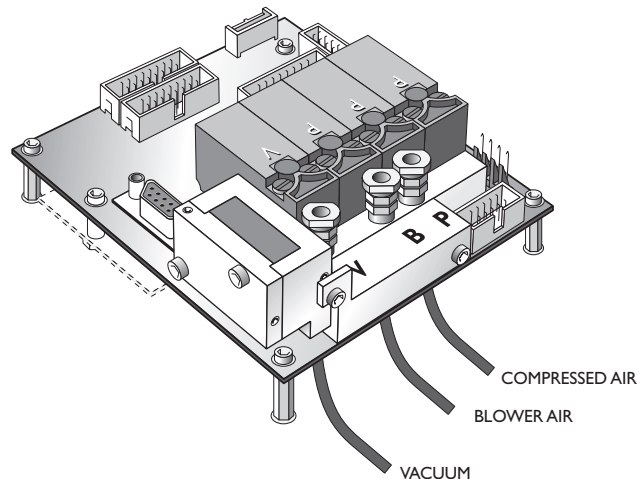


Figure 12 Manifold board

The manifold board controls the vacuum and pneumatic, and is the electrical interface between each placement head HA and its placement head HA controller.

The manifold boards are located on the X carriage. For component presence or absence detection a pressure sensor is built in the vacuum circuit to measure the vacuum flow. A reference sensor is implemented to compensate the influence of variations in the level of the vacuum pressure.

On the placement head there are four pneumatic functions through the manifold board manifold, each controlled by a digital output of the placement head HA controller:

- Vacuum, used to hold the SMD between the moment of pick-up and placement.
- Select Nozzle, default OFF, selects the inner nozzle
- Blower Air, for a quick release of the component. Blower air is used to speed up the reduction of the vacuum level in the tube to the nozzle.
- Release Toolbit, to exchange toolbits (RELEASE/GRIP) default is GRIP.

For each pneumatic function a valve is used. The four valves and the vacuum sensor are mounted on a mechanical block. The layout is such that all electrical connections of the valves and the vacuum sensor are located on assembly.

For a diagram of the manifold board, see [Figure 34](#).

D4.3.3 Placement head HA

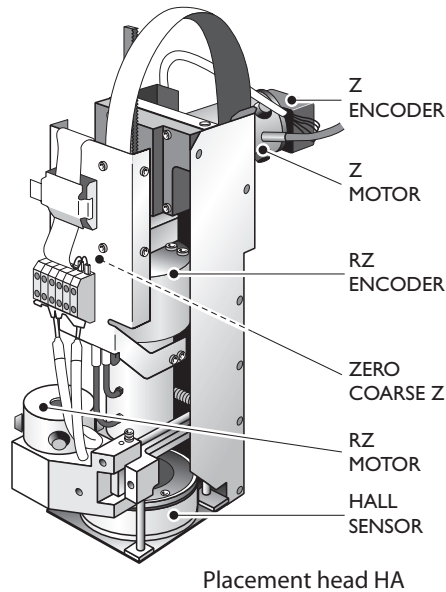


Figure 13 Placement head HA

Moving up and down (Z motor) and rotating (R motor) (a Z force sensor on the placement head is used to measure the Z force) are controlled by the placement head HA controller (Figure 11).

Using a toolbit, it can pick, rotate and place any component within the work area. Pick-up is done by a vacuum system. Component presence detection is done by a vacuum sensor while relative position is checked by the vision system.

On the placement head two analogue signals are measured by a vacuum sensor and a hall sensor. Since the placement head HA controller has only one analogue input, the select_analogue output can select, via an analogue multiplexer, one of these signals. The analogue signals consist of:

- The vacuum level in a nozzle - measured by a pressure sensor;
- The compression of the spring in the Force Control Unit (FCU) that is measured by a Hall sensor.

D4.3.4 Z-Motor

The Z-motor (Figure 11) is a dc servo motor that can move the placement head up and down over a distance of 77 mm. During the pick and place actions, the Z-motor is used to move the toolbit up and down with or without holding a component and to apply a Z force to a component at the placement position.

D4.3.5 Z-Encoder

One revolution of the Z-motor moves the placement head over a distance of 26.4 millimetres. The Z-encoder (Figure 11) produces 500 pulses (S0-S90) per revolution. The placement head HA controller counts the edges of the S0-S90 signals and brings the resolution to 2000 increments per revolution.

D4.3.6 Zero_coarse_Z Sensor

The Zero_coarse_Z sensor (Figure 11) is an EPD installed on the placement head. It is used during the home search of the Z-motor. The sensor detects the uppermost position of the placement head, so the XY robot can move safely.

D4.3.7 RZ motor

The RZ motor (Figure 11) is a dc servo motor. It can rotate the toolbit over unlimited angles within the counter range of the controller.

D4.3.8 RZ encoder

The RZ encoder (Figure 11) is placed on the toolbit axis and produces two sine-wave analogue encoder signals which shift 90 °. On an interpolation board (ID101) these signals are interpolated five times. The interpolator is mounted as a piggyback to the Manifold board, it gives 12,500 pulses per revolution. The placement head HA controller counts the edges of the signals and brings the resolution to 50,000 increments/revolution.

D4.3.9 Toolbits for placement head HA

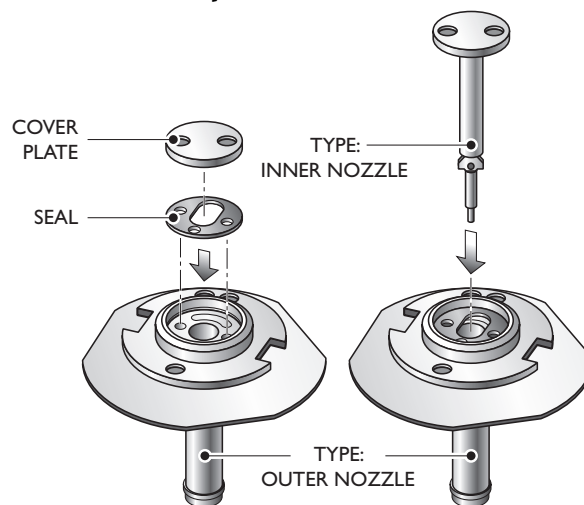


Figure 14 Toolbits

Toolbits are used to pick and place components and can be exchanged manually or automatically.

Components are placed on a board with a defined force, called Z-force. The impact to a component, at the time that the component hits the surface of the board, may not exceed the maximum Z-force for the handled component.

Two types of toolbit are used on the placement head:

- The outer nozzle; the outer nozzle is a small pipe placed at the bottom of the placement head and holds the SMD components by means of a vacuum. The vacuum is activated by a valve, located on the manifold and controlled by the HC.
- The inner nozzle; the principle of the inner nozzle is much the same as that of the outer nozzle. The construction is such that the inner nozzle has to be mounted in the outer nozzle. The inner nozzle can be moved out of the outer nozzle by means of a pneumatic cylinder.

D4.3.9.1 Automatic toolbit release

The toolbit release spring is mounted each placement head. The spring is responsible for pushing the toolbit downwards and out of the nozzle interface.

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D4.3.10 Gripper for placement head HA

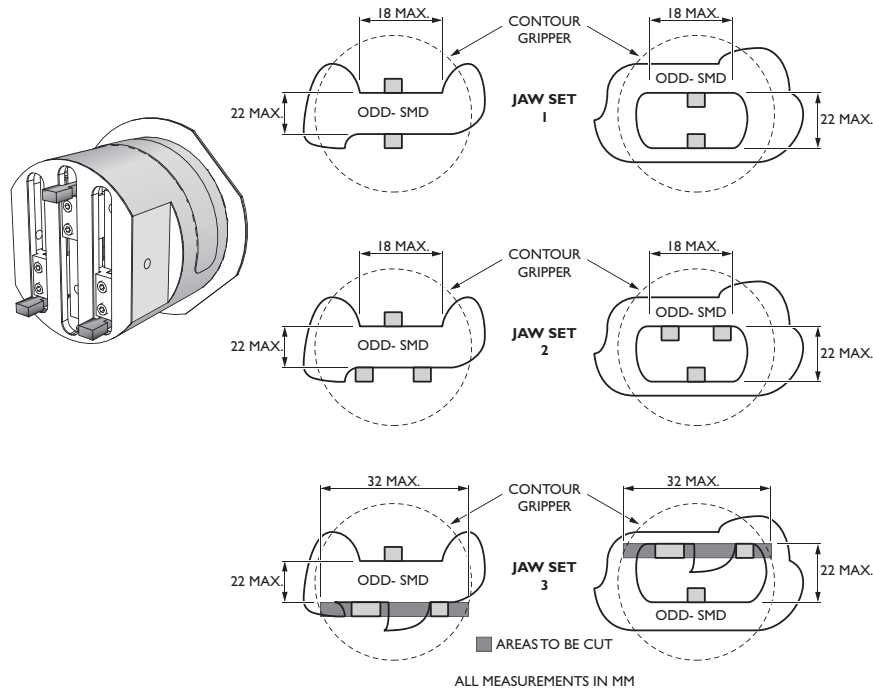


Figure 15 Grippers

The grippers are used to pick and place odd-SMDs and can be manually or automatically exchanged.

Before an odd-SMD can be picked, the gripper is activated. Picking is realized by deactivating the odd-SMD gripper. Placing the odd-SMD on the board is done by activating the odd-SMD gripper.

Components are placed on a board with a defined force, called Z-force. The impact to a component, at the time that the component hits the surface of the board, may not exceed the maximum Z-force for the handled component

D4.4 Toolbit exchange unit

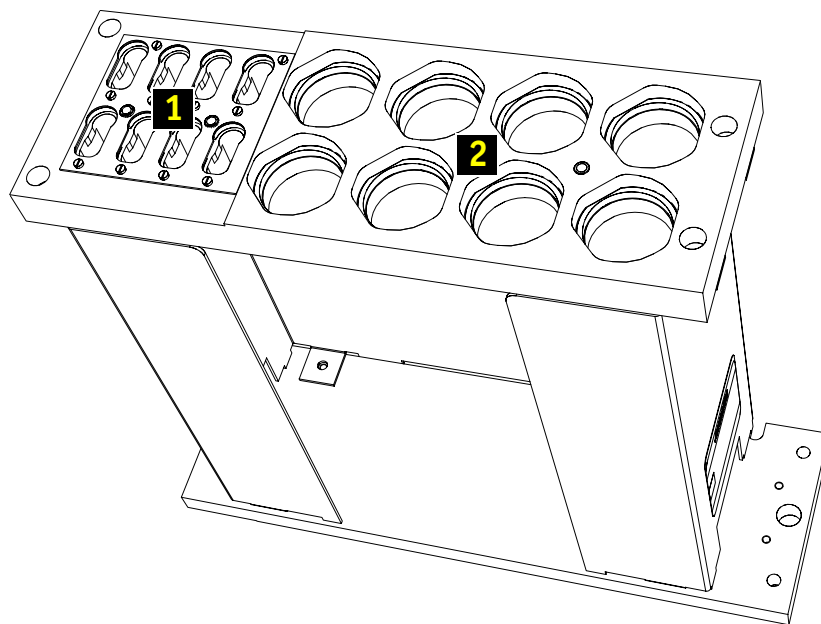


Figure 16 Toolbit exchange unit

1. Toolbit station for placement head DV.
2. Toolbit station for placement head HA.

D4.5 Reuse station

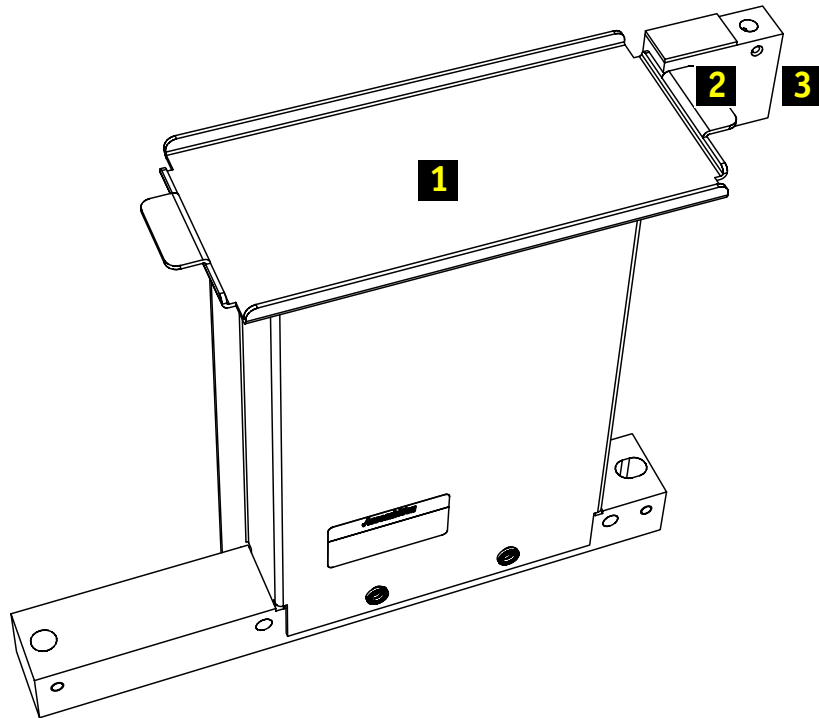


Figure 17 Reuse station

1. The reuse station is used to collect rejected components that are too valuable to waste and might be repaired. The rejected components will be placed on unique places. If the station is full, a warning will be given.
2. Vacuum calibration pad.
Rubber pad to calibrate vacuum for normal toolbit types.
3. Melf vacuum calibration pad.
Special shaped pad to be able to block the airflow of a melf toolbit.

CHAPTER D5 Troubleshooting

D5.1 Troubleshooting workflow

The troubleshoot chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.



NOTE: Using the electronic version of the manual will enable the user to use hyperlinks and the 'back' button in the browser to navigate quickly through the information in separate paragraphs.

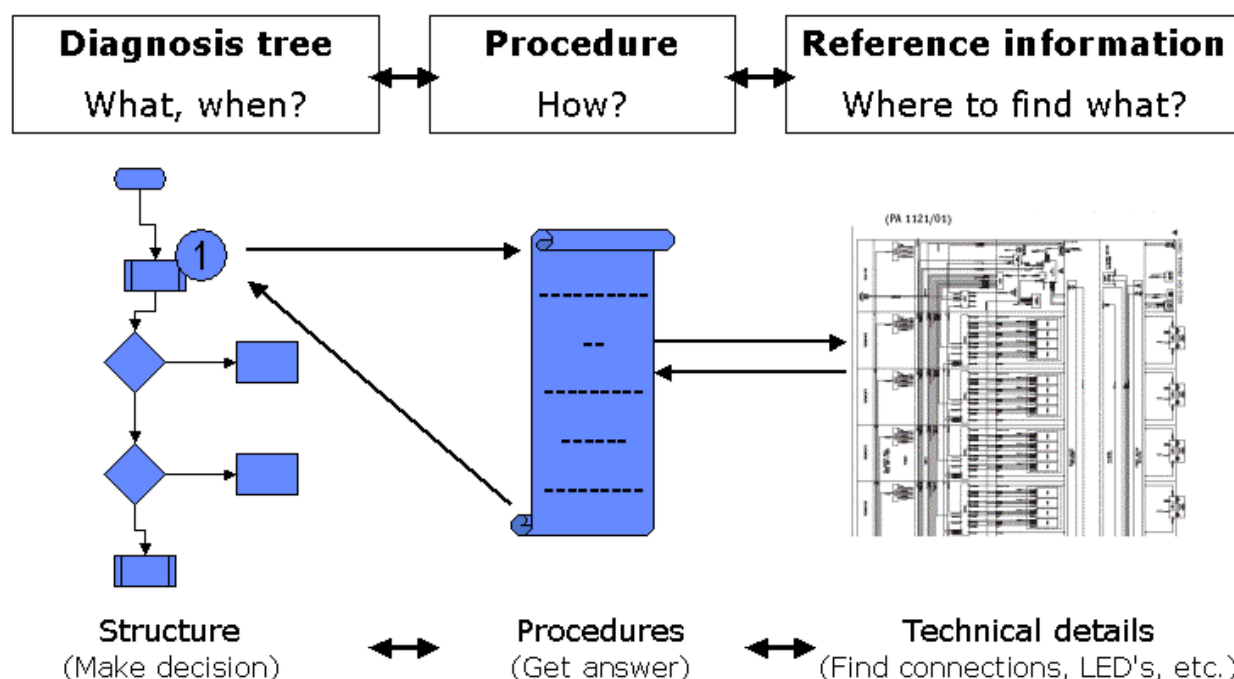
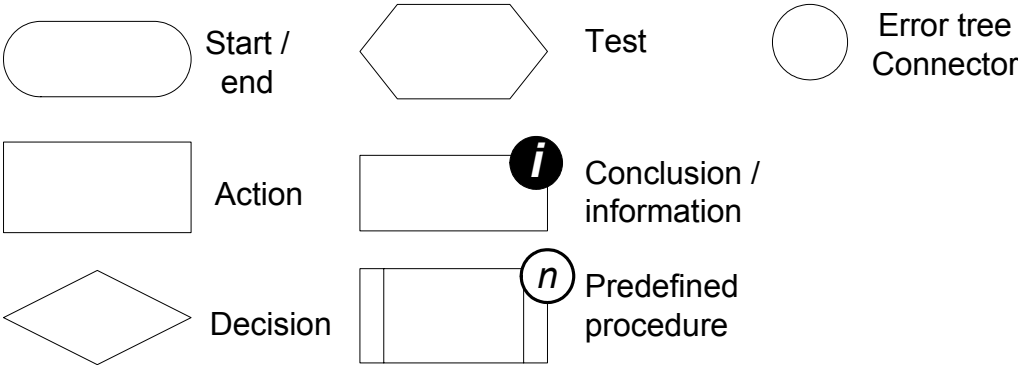


Figure 18 Workflow

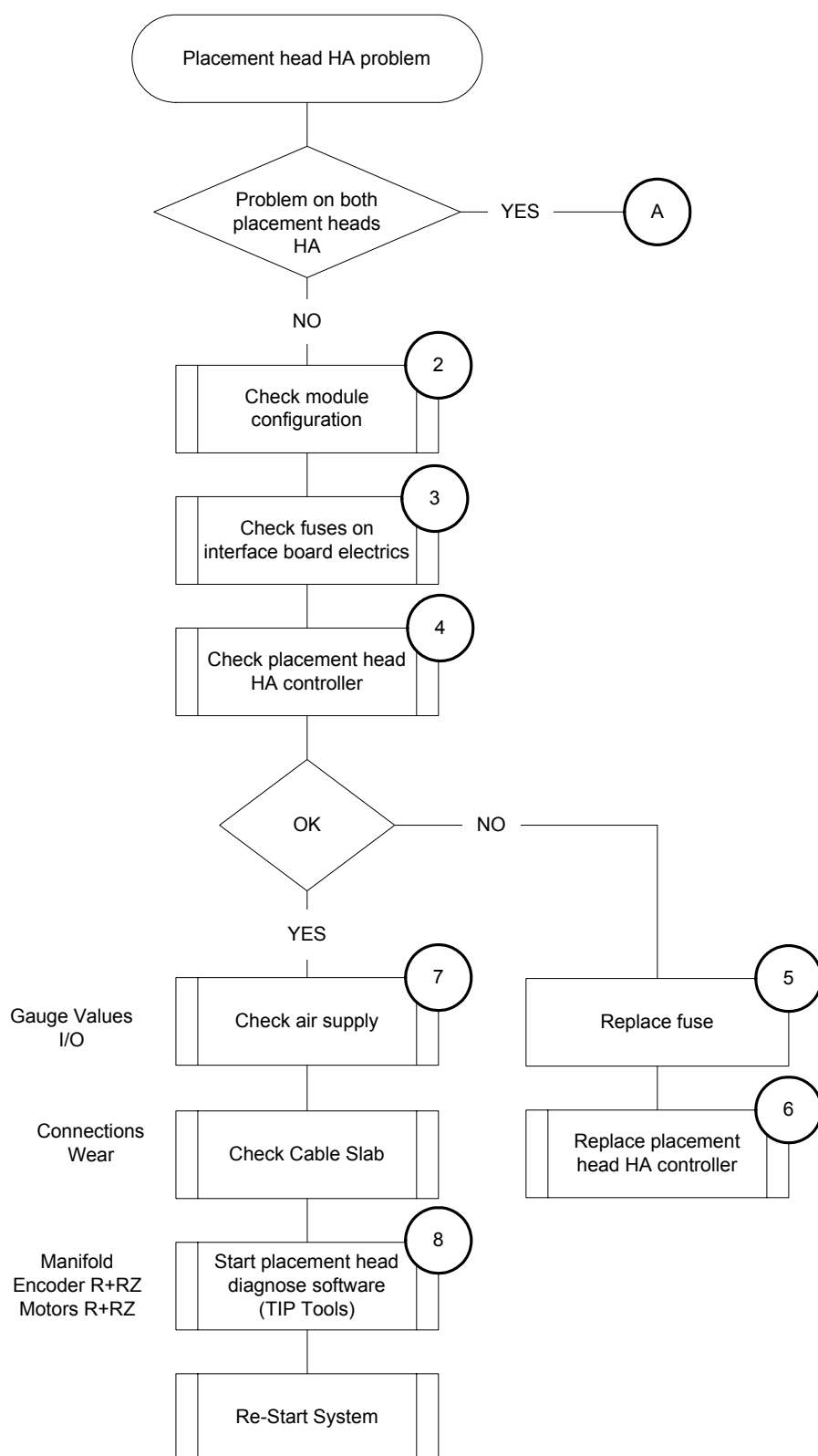
D5.2 Diagnosis trees and tables

D5.2.1 Diagnosis trees, conventions



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D5.2.2 Placement head HA, general diagnosis tree

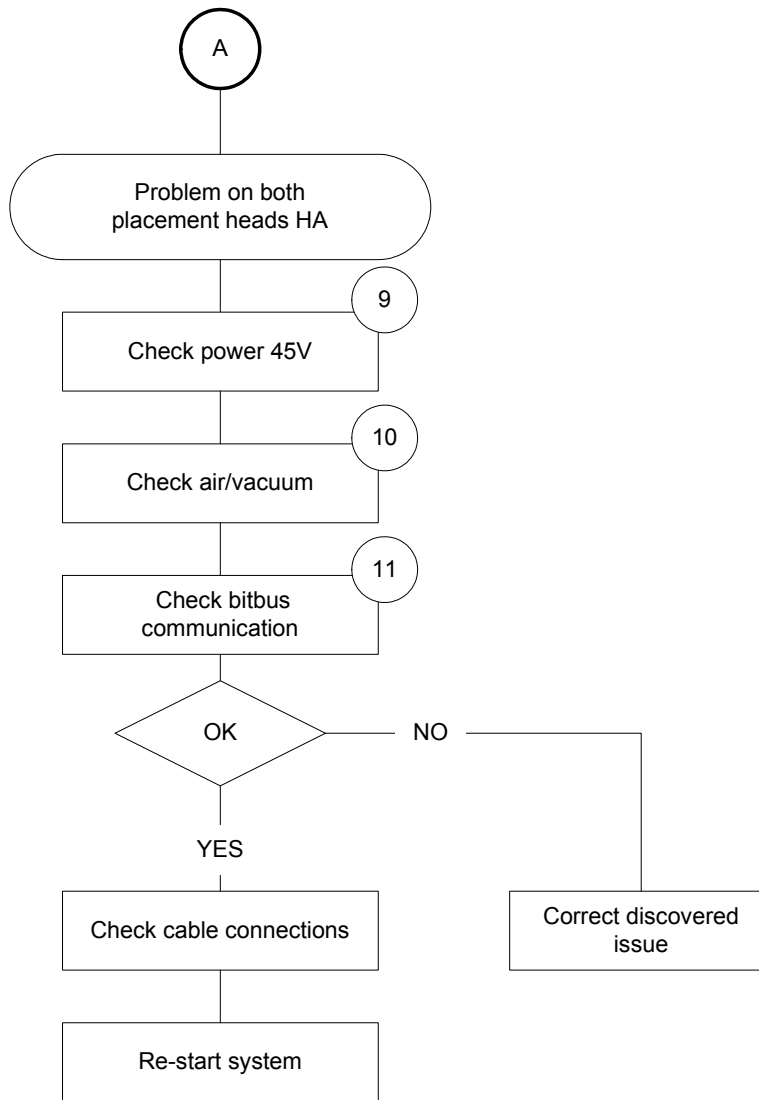


Reference:

1. See next page
- 2.A5.2.3 Pneumatics and vacuum, diagnosis tree
3. See User Reference manual
- 4.B5.3.14 Interconnection board electrics, fuses and LED signalling
- 5.D5.3.4 Placement head HA controller, features
- 6.D5.3.2 Placement head DV controller, features
- 7.D8.9 Placement head HA controller, replacement
- 8.D5.2.2 Placement head HA, general diagnosis tree
- 9.A5.1.3 TIP tools

Figure 19 Placement head HA, general diagnosis tree 1

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Reference:

- 9. [B5.3.14 Interconnection board electrics, fuses and LED signalling](#)
- 10. [B5.2.5 Air supply unit, diagnosis table](#)
- 11. [A5.1.4 Bitbus communication check](#)

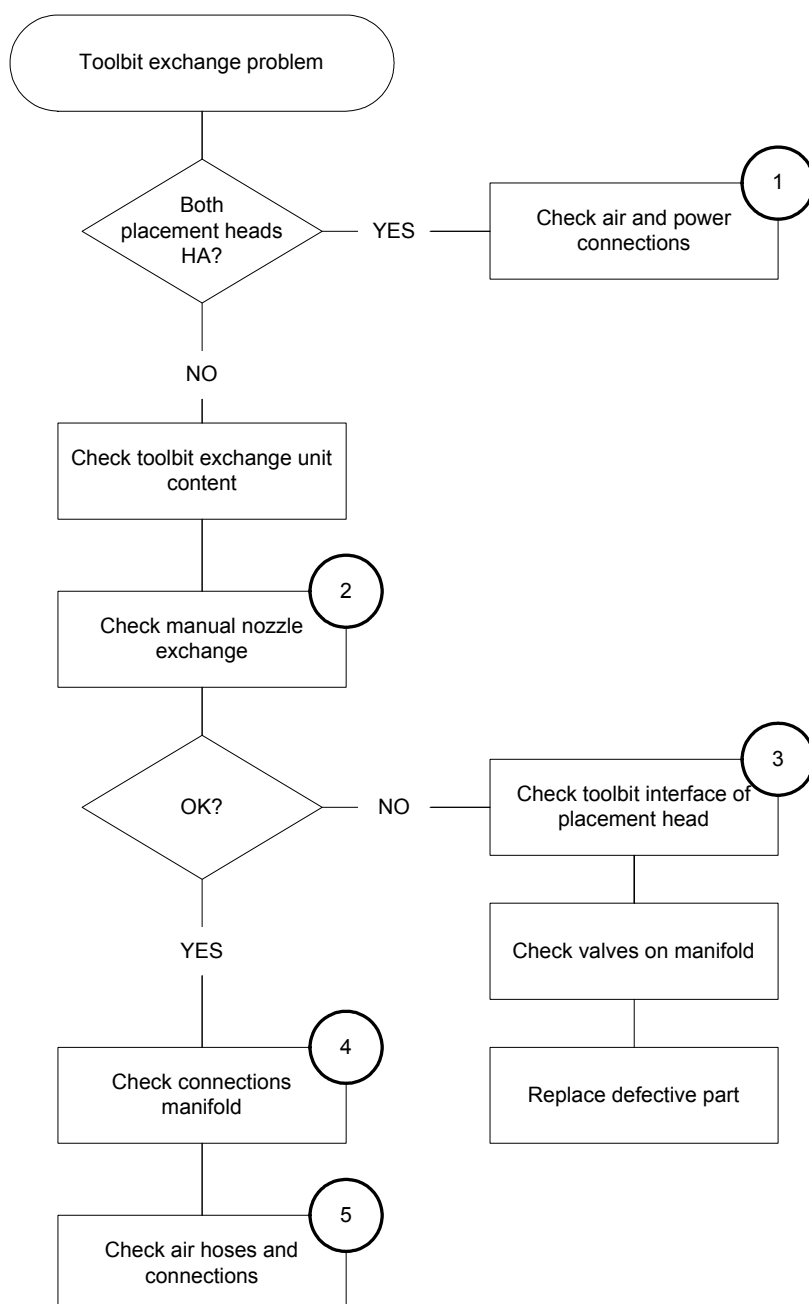
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Figure 20 Placement head HA, general diagnosis tree 2

D5.2.3 Placement head HA, nozzle exchange

Reference:

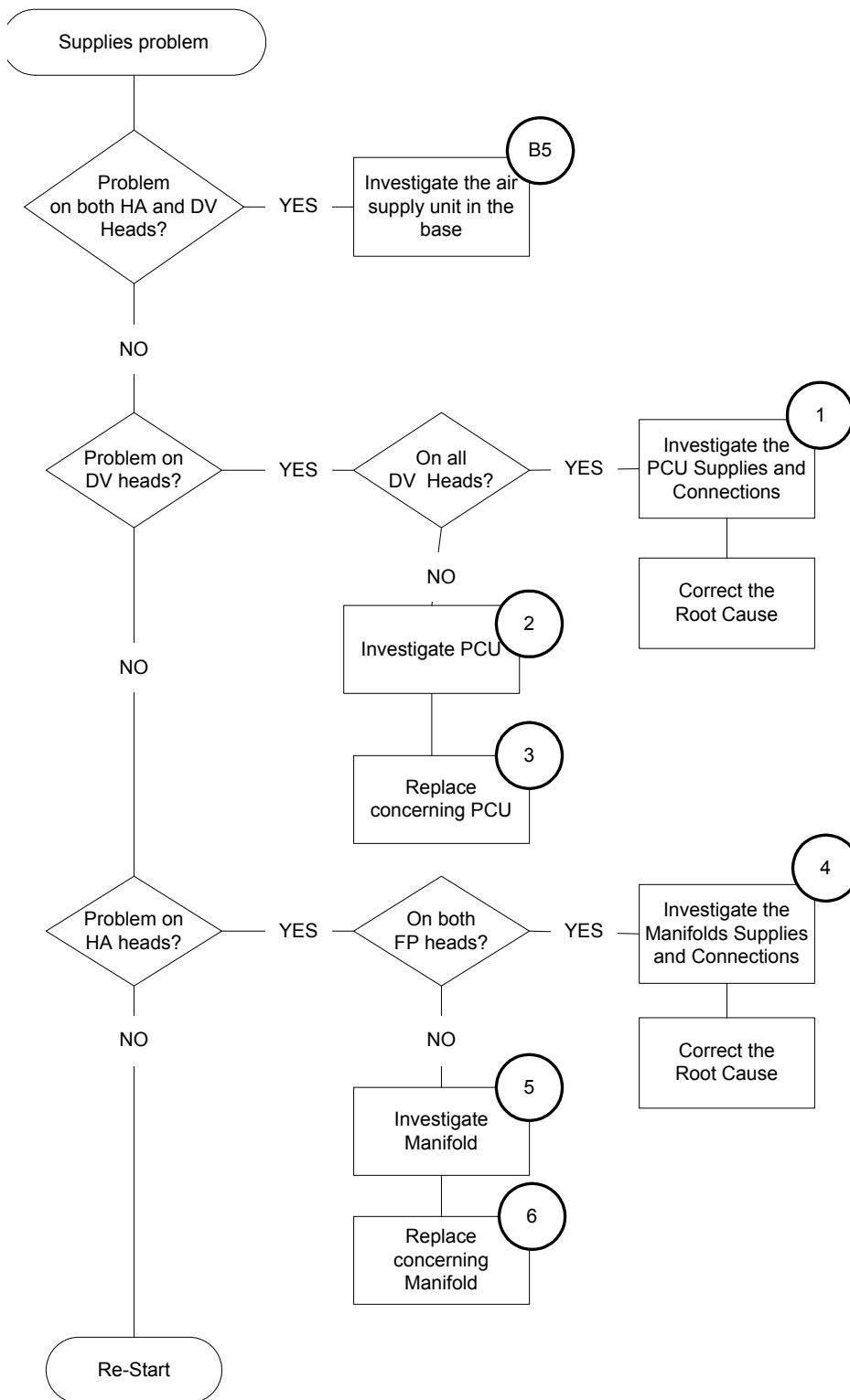
To be defined



D5.2.4 Placement heads, supplies problem

Reference:

To be defined



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D5.3 Reference information

D5.3.1 Pneumatic controller, features

Pneumatic controllers exist in two technical versions, with two or three valves.
For the AX-201 however, they are functional the same.
This means that the clean valve is not supported.

D5.3.1.1 Pneumatic controller (3-valve), features

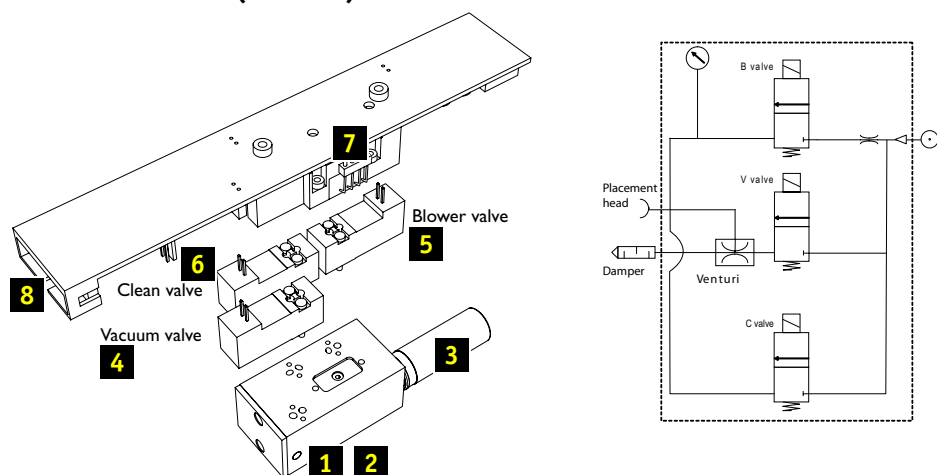


Figure 21 Pneumatic controller (3-valve), features

No.	Description
1	Air supply, 5-6 bar.
2	Outgoing vacuum / compressed air to toolbit.
3	Damper
4	Vacuum valve
5	Blower valve
6	Clean valve
7	Vacuum sensor
8	Connections, see D5.3.2.Placement head DV controller, features Signals, see D5.3.3.Placement head DV controller, signals on X1, X2

Figure 22 Pneumatic controller (3-valve), interfaces

D5.3.1.2 Pneumatic controller (2-valve), features

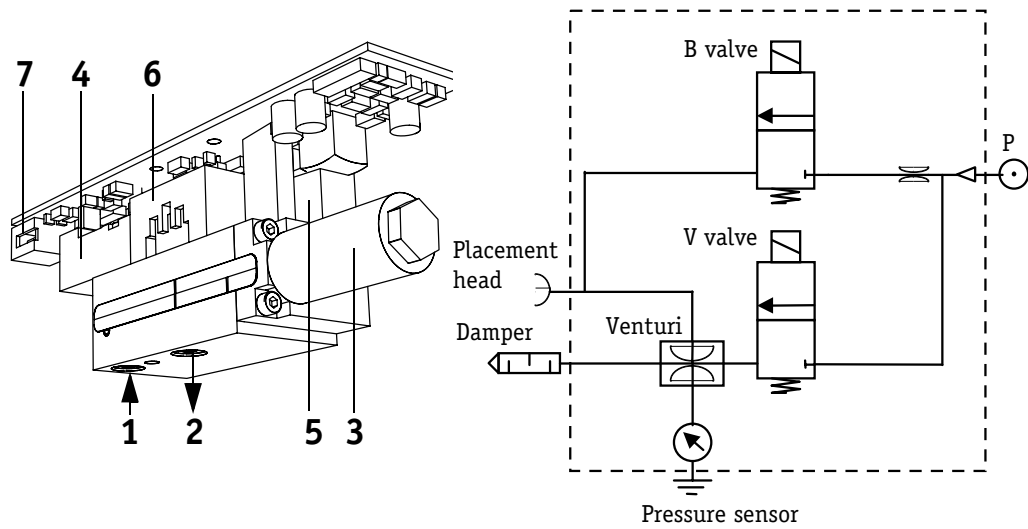


Figure 23 *Pneumatic controller (2-valve), features*

No.	Description
1	Air supply, 5-6 bar.
2	Outgoing vacuum / compressed air to toolbit.
3	Damper
4	Vacuum valve
5	Blow-off valve
6	Vacuum sensor
7	Connections, see D5.3.2.Placement head DV controller, features Signals, see D5.3.3.Placement head DV controller, signals on X1, X2

Figure 24 *Pneumatic controller (2-valve), interfaces*

D5.3.2 Placement head DV controller, features

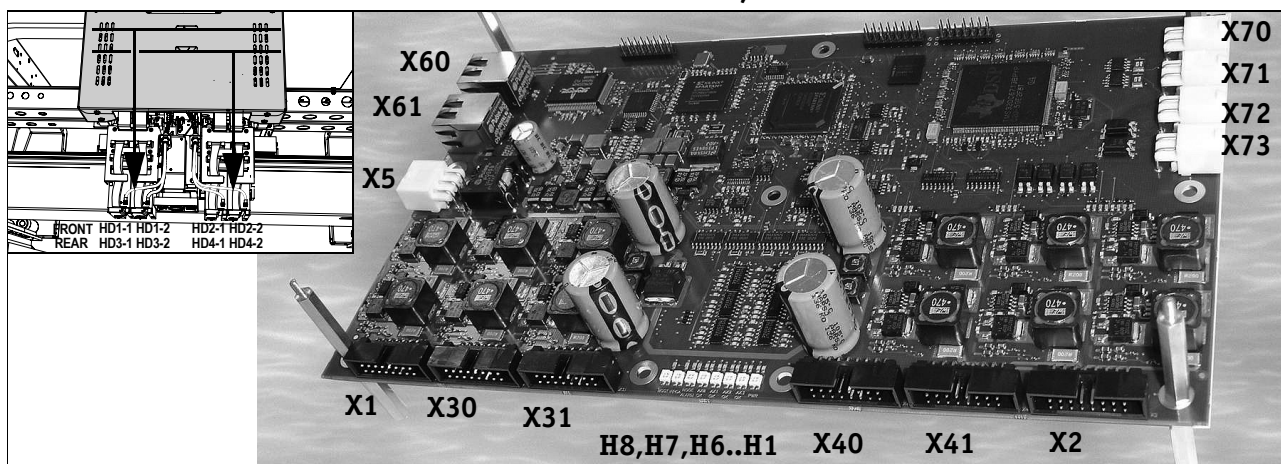


Figure 25 Placement head DV controller, features

LED	Function	Colour	Meaning
H1	Power	Off	No power / FPGA not configured
		Red	24V NOK
		Green	24V OK
H2	Axis 0 status HDx-1 head Z-direction	Off	Axis0 disabled
		Red	Axis0 fatal error
		Orange	Axis0 initializing
		Green	Axis0 enabled
		Green blinking	(together with other axis leds) Bootloader
H3	Axis 1 status HDx-1 head RZ-direction	Off	Axis1 disabled
		Red	Axis1 fatal error
		Orange	Axis1 initializing
		Green	Axis1 enabled
		Green blinking	(together with other axis leds) Bootloader
H4	Axis 2 status HDx-2 head Z-direction	Off	Axis2 disabled
		Red	Axis2 fatal error
		Orange	Axis2 initializing
		Green	Axis2 enabled
		Green blinking	(together with other axis leds) Bootloader
H5	Axis 3 status HDx-2 head RZ-direction	Off	Axis3 disabled
		Red	Axis3 fatal error
		Orange	Axis3 initializing
		Green	Axis3 enabled
		Green blinking	(together with other axis leds) Bootloader
H6	Node alarm	Off	No error
		Red	Synqnet error
H7	FPGA	Green	Network cyclic
		Green blinking	Network not cyclic
H8	Boot status	Green	Loaded runtime image into FPGA
		Dimmed	Loaded boot image into FPGA

Figure 26 Placement head DV controller, LED signalling

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Connector	Function
X1	Pneumatic controller left
X2	Pneumatic controller right
X5	Power supply
X30	Placement head DV - Z left
X31	Placement head DV - RZ left
X40	Placement head DV - Z right
X41	Placement head DV - RZ right
X60	Synqnet input
X61	Synqnet output
X70	-
X71	Auxiliary I/O output, air valve of Z-lift cylinder
X72	Auxiliary I/O input, EPD of Z-lift
X73	-

Figure 27 Placement head DV controller, connections

D5.3.3 Placement head DV controller, signals

Pins	Description	Pins	Description
SQDRIVE1.X1, SQDRIVE2.X1 Pneumatic controller			
1	Digital output valve 1+	9	EARTH
2	Digital output valve 1-	10	Temperature sensor_A
3	Digital output valve 2+	11	Temperature sensor_B
4	Digital output valve 2-	12	Not connected
5	Digital output valve 3+	13	EARTH
6	Digital output valve 3-	14	Vacuum sensor on pneumatic controller_B
7	Reference	15	Vacuum sensor on pneumatic controller_A
8	Power supply +24V	16	Reference
SQDRIVE1.X5 SQDRIVE2.X5 Supply			
1	DC power 44V	4	DC power 24V
2	DC power return 44V	5	DC power return 24V
3	Shield	6	Shield
SQDRIVE1.X30 SQDRIVE1.X31 SQDRIVE1.X40 SQDRIVE1.X41 Placement head DVs			
SQDRIVE2.X30 SQDRIVE2.X31 SQDRIVE2.X40 SQDRIVE2.X41			
1	Motor phase R	9	Shield
2	Motor phase R	10	Digital switch input
3	Motor phase S	11	RZ motor A-
4	Motor phase S	12	RZ motor A+
5	Motor phase T	13	RZ motor B-
6	Motor phase T	14	RZ motor B+
7	Ground	15	RZ motor I-
8	Power supply +24V	16	RZ motor I+
SQDRIVE1.X71 SQDRIVE2.X71 Z-lift (air valve of Z-lift cylinder)			
1	Output +24V	3	-
2	digital output 0, -	4	-
SQDRIVE1.X72 SQDRIVE2.X72 Z-lift (EPD of Z-lift)			
1	Output +24V	3	Digital output +24V
2	-	4	Power return of +24V

Figure 28 Placement head DV controller, signals

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D5.3.4 Placement head HA controller, features

This part is mounted in the control supply, see [B5.3.1 Control supply, lay-out](#)

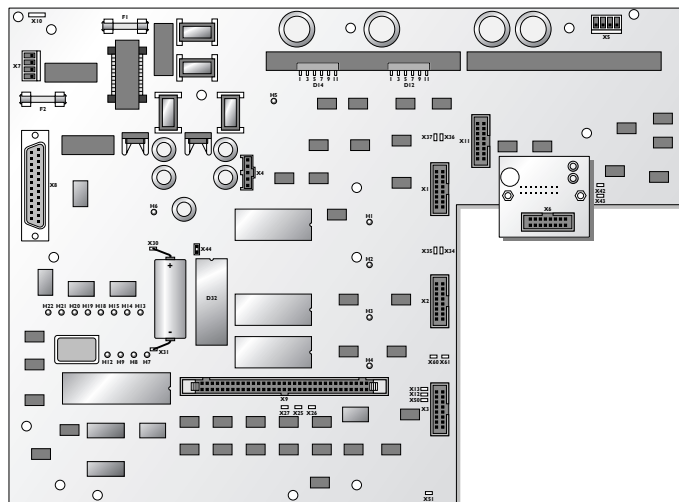


Figure 29 Placement head HA controller, LED signalling

LED	ON/OFF	SYSTEM STATUS
H3	ON	Zero fine Φ encoder
H4	ON	Zero fine Z encoder
H5	ON	24V supply < 16V (power failure)
H6	ON	45V supply > 25V (emergency stop)
H7	ON	Digital input - Φ EPD, zero coarse Z
H9	ON	Digital input - Enable controllers
H13	ON	Digital output - Select nozzle/grip
H14	ON	Digital output - Vacuum
H15	ON	Digital output - Exchange toolbit
H18	ON	Digital output - Select analogue
H19	ON	Digital output - PC busy
H21	ON	Digital output - Emergency head control
H22	ON	Digital output - Enable Φ amplifier

Figure 30 Placement head HA controller - LED status

IDENT	STATUS	SYSTEM FUNCTION
X1	Connector	Φ drive, zero EPD Z, Φ encoder error
X2	Connector	Z encoder
X3	Connector	Digital and analog I/O
X5	Connector	Z motor
X6	Connector	LEDs, Filter print
X7	Connector	Power input
X8	Connector	Bitbus communication
X10	Connector	Cabinet ground
X30	Test point	Battery +
X31	Test point	Battery -
X44	Jumper	Enable write EPROM (must be set)

D5-00003.fm

IDENT	STATUS	SYSTEM FUNCTION
X51	Test point	Amplified vacuum reference/Hall sensor value
X60	Test point	Monitor out
X61	Test point	Monitor ground
F1	Fuse	45V/4A
F2	Fuse	24V/2A

Figure 31 Placement head HA controller, connections

D5.3.5 Manifold board for placement head HA

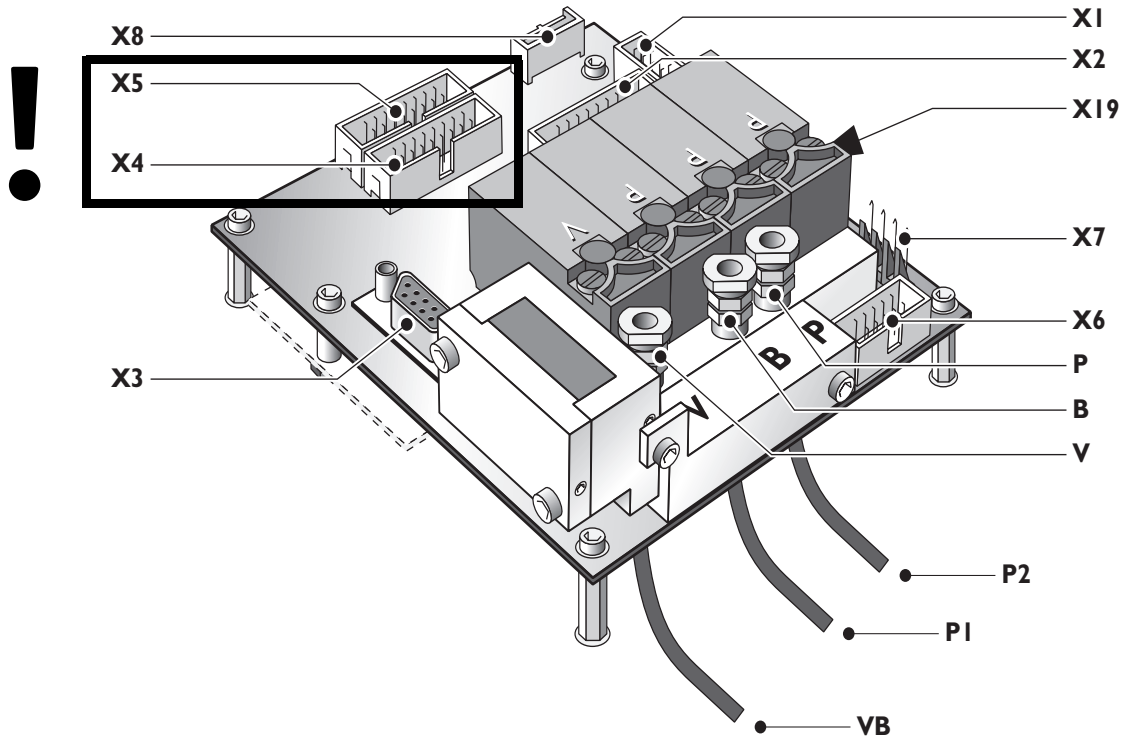


Figure 32 Manifold board



NOTE: Do not mix up connector X4 and X5.
A wrong connection will damage the Z encoder on the placement head HA.

D5.4.2 Placement head HA, diagrams

D5.4.2.1 Manifold board, pneumatic diagram

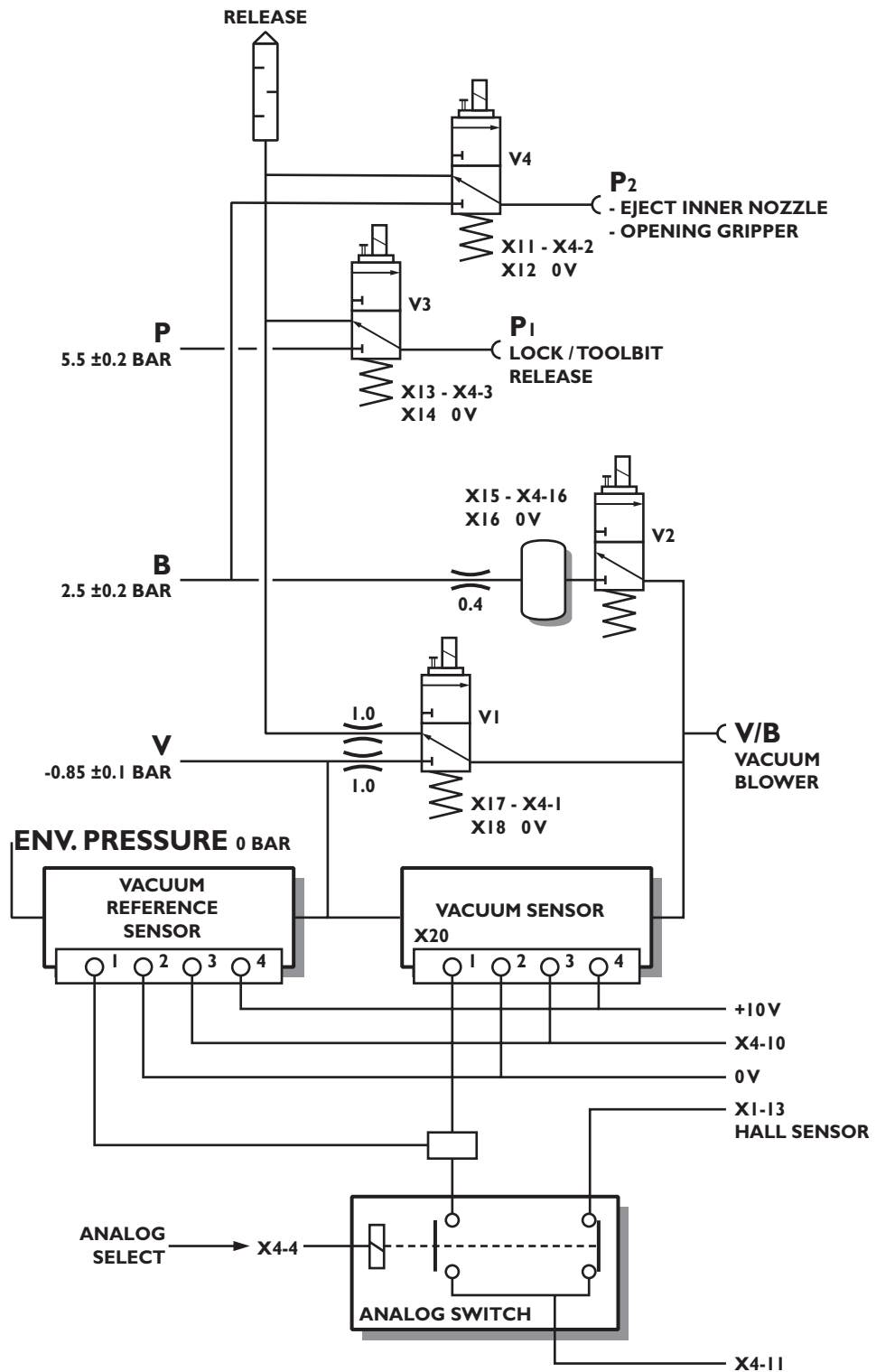


Figure 34 Manifold board, pneumatic diagram

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D5.4.2.2 Placement head HA, controller X1, interconnection diagram

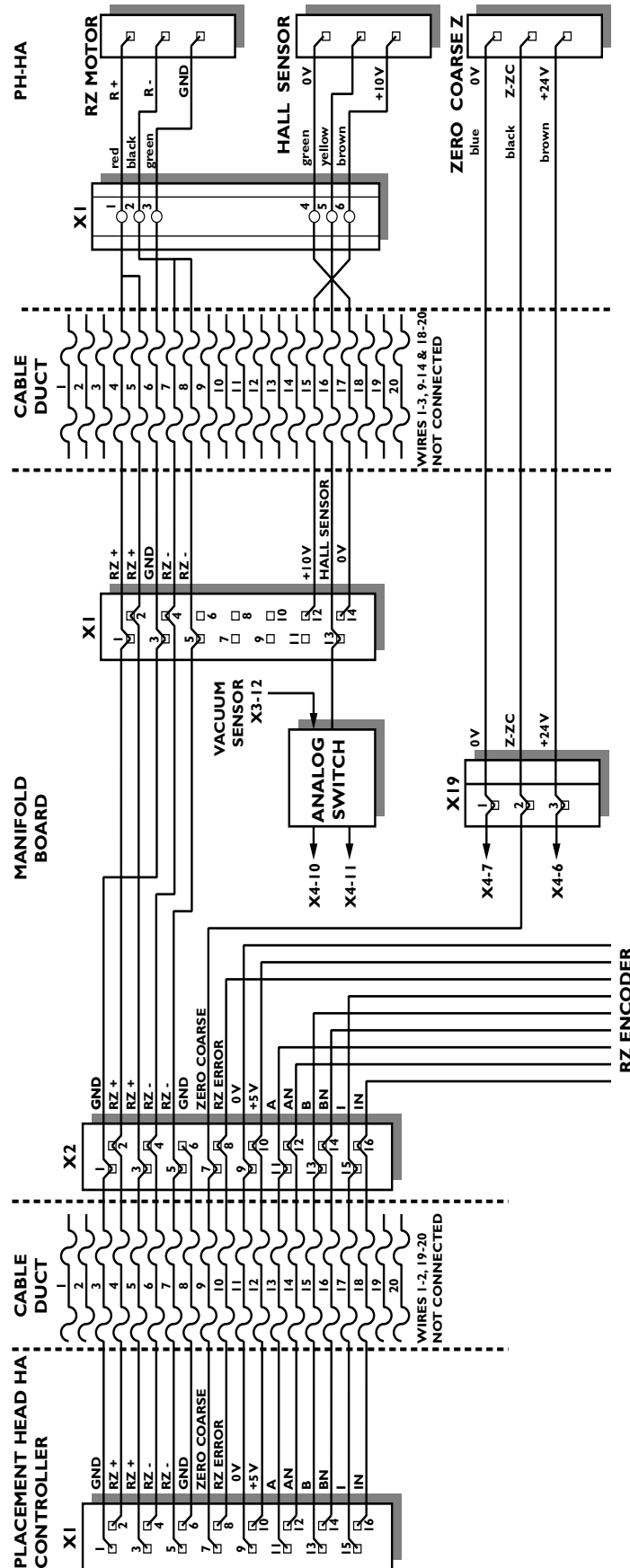


Figure 35 Placement head HA, controller X1, interconnection diagram

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D5.4.2.3 Placement head HA, RZ encoder, interconnection diagram

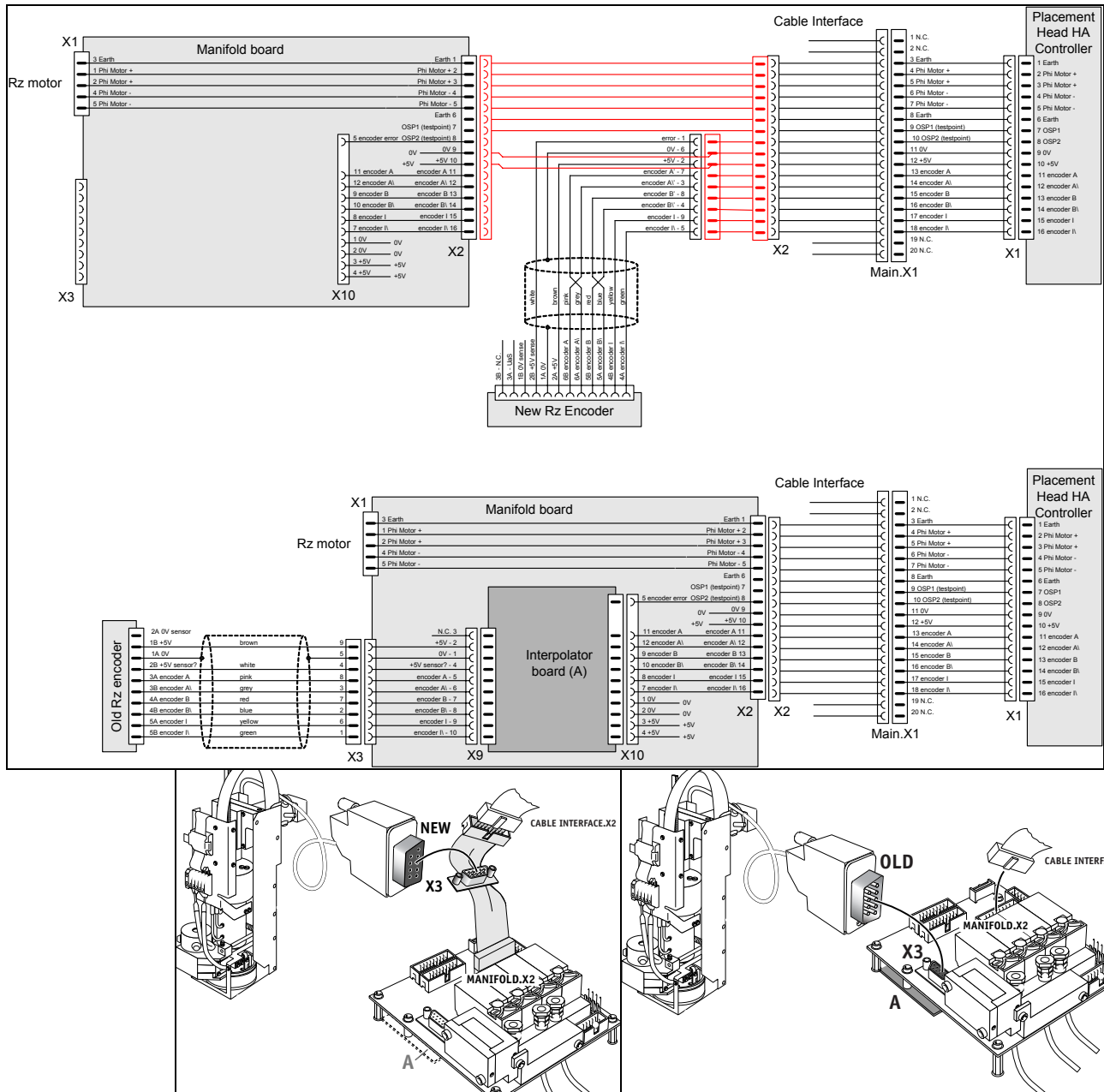


Figure 36 Placement head HA, RZ encoder, interconnection diagram

D5.4.2.4 Placement head HA, controller X3, interconnection diagram

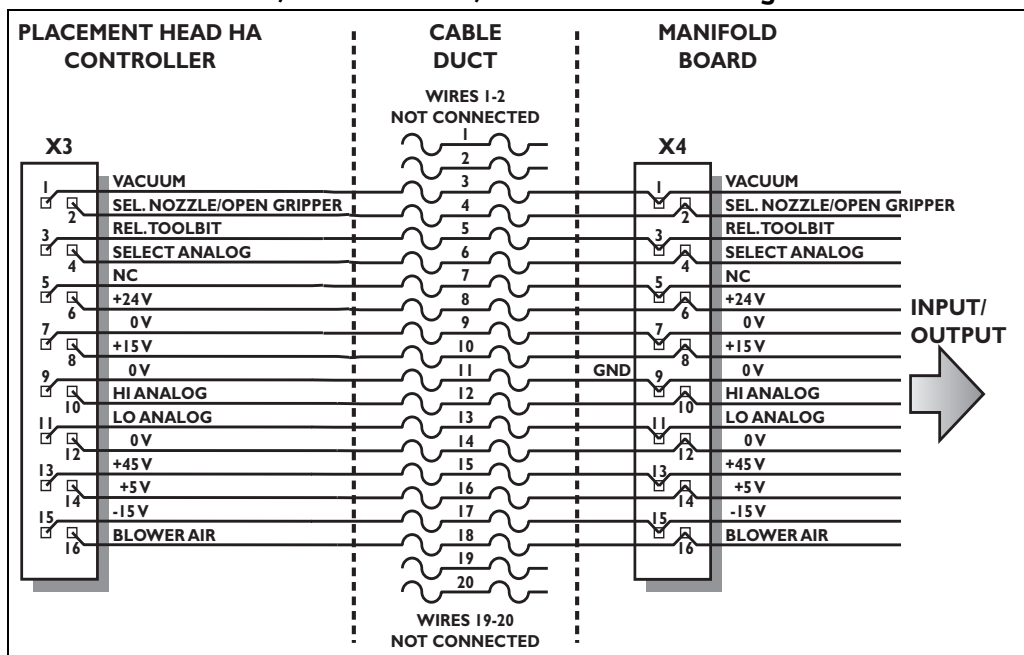


Figure 37 Placement head HA, controller X3, interconnection diagram

D5.4.2.5 Placement head HA, Z-motor interconnection diagram

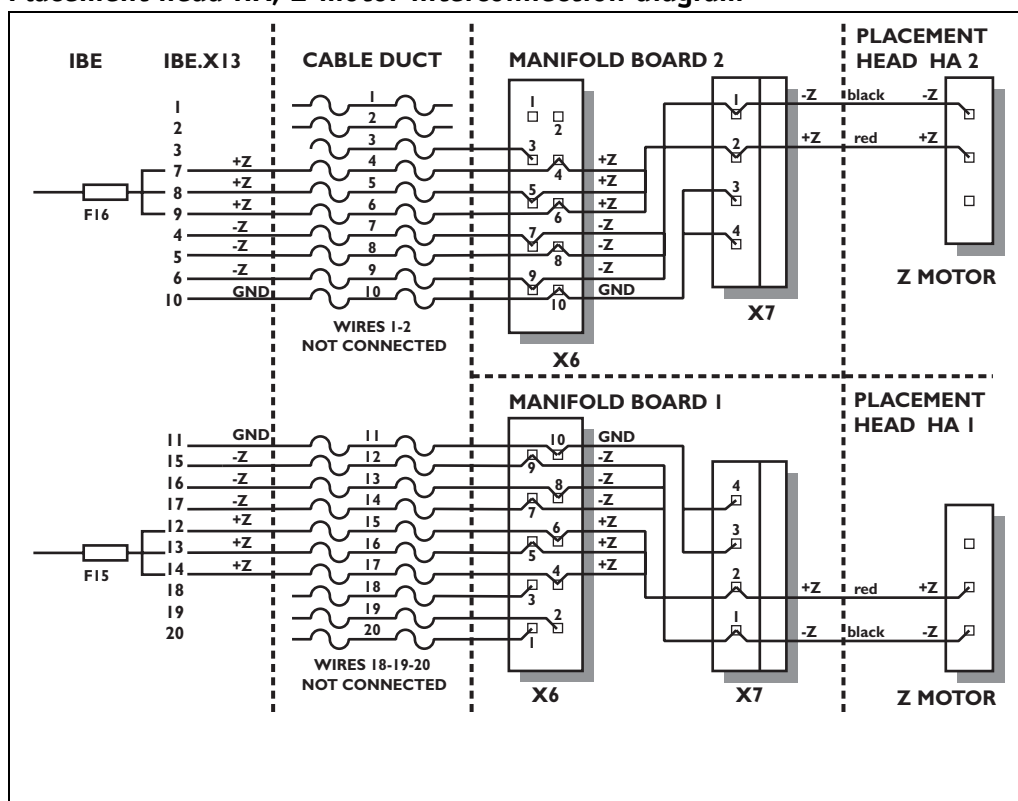


Figure 38 Placement head HA, Z-motor interconnection diagram

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D5.4.2.6 Placement head HA, Z-encoder interconnection diagram

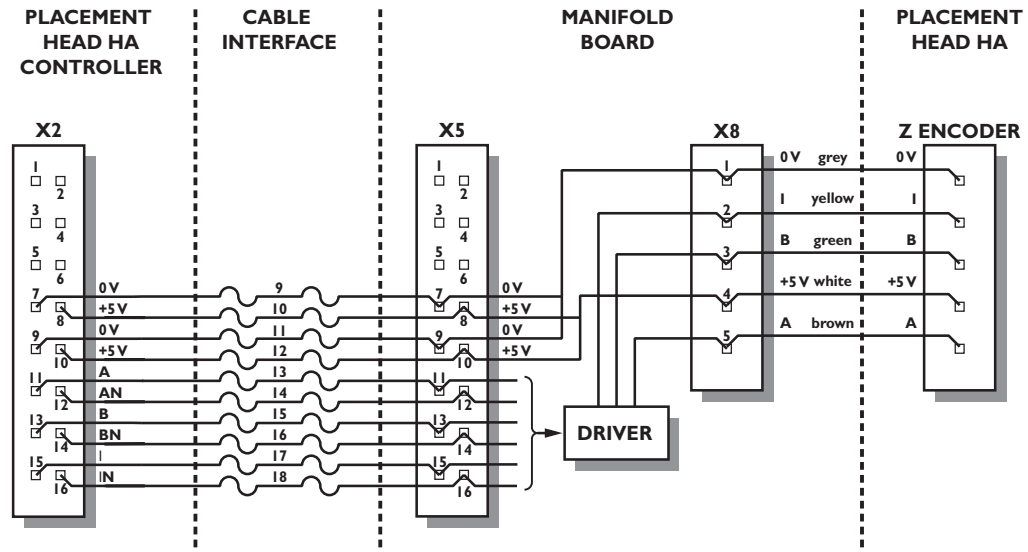


Figure 39 Placement head HA, Z-encoder interconnection diagram

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D5.4.3 Placement head DV diagrams

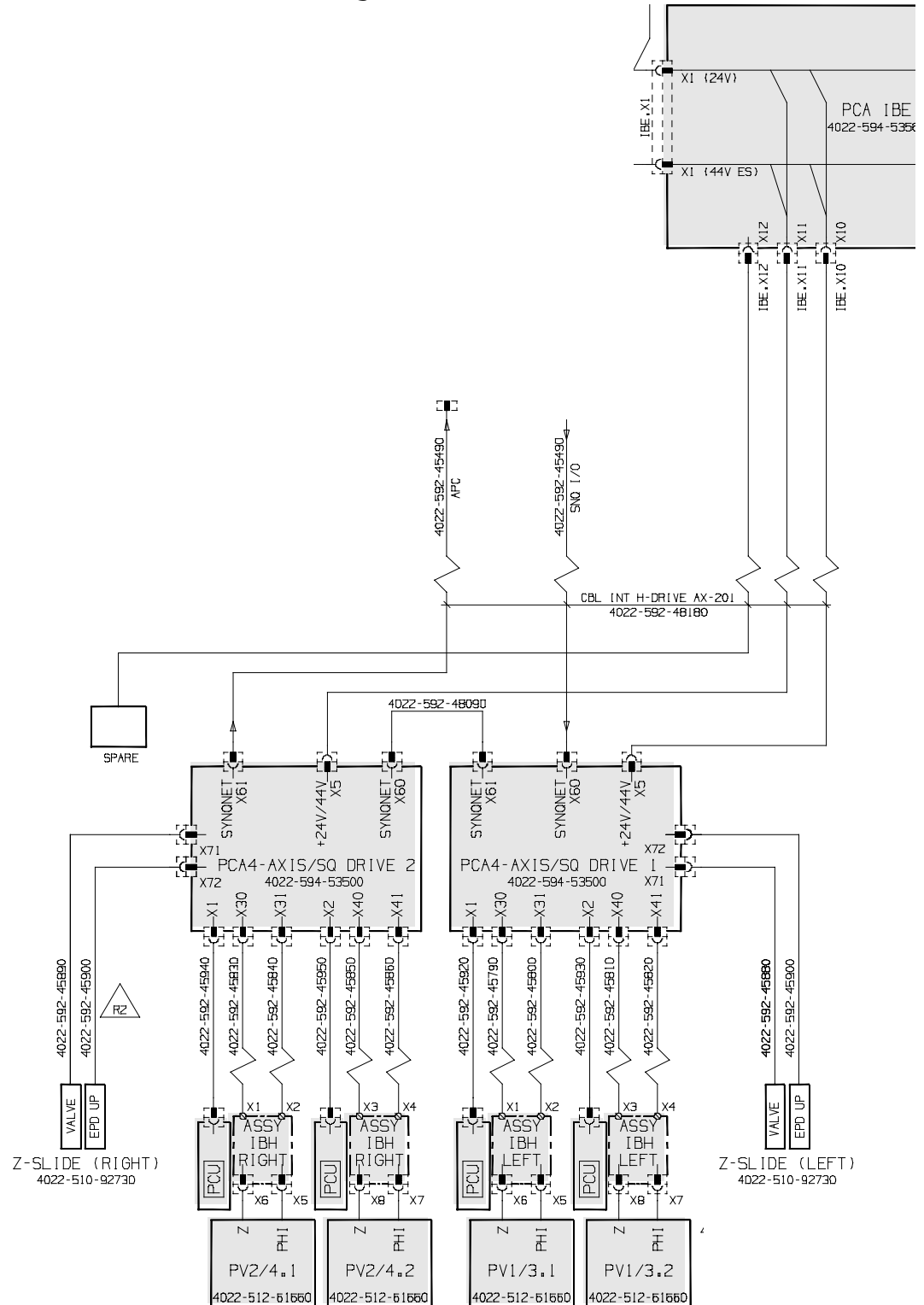


Figure 40 Placement head DV, diagram

Complete diagram, see [A5.3.1.2.Wiring diagram PA2410/00](#)

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CHAPTER D6 Measurement, adjustment and calibration

D6-00001.fm

D6.1 Placement head HA, measuring friction of the RZ movement

Estimated time to complete [min.]: 15
Required special tools: Torque meter 0-5 Nm
Required part(s) -

1. Measure friction of the RZ drive, 1

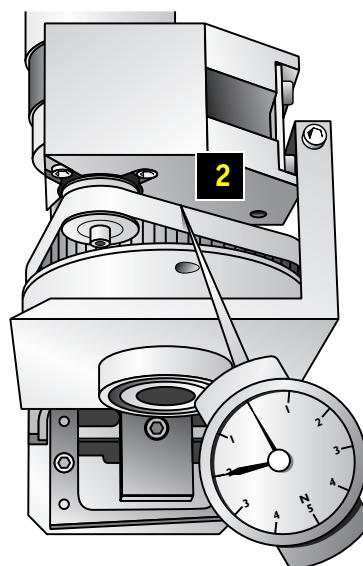
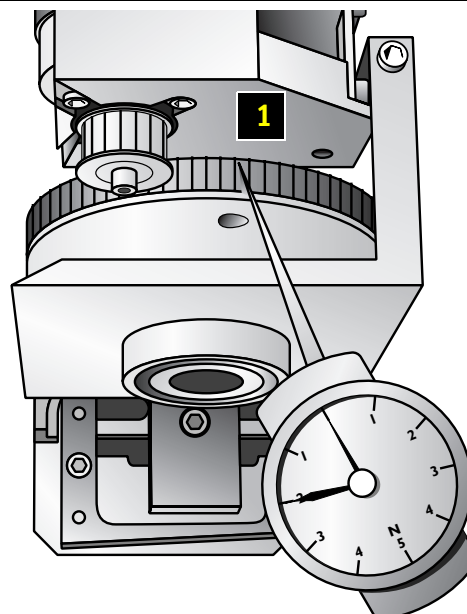
- Disconnect the RZ motor connection X1 at the interconnection board;
- Remove the drive belt;
- Hold the torque meter (5 N) against the edge of a tooth on the force control unit drive gear and measure the friction of the RZ drive (0.8 N).
- If not OK, see [D7.9 Placement head HA, checking, cleaning and lubricating](#)

2. Measure tension of the RZ drive, 2

- Install the belt and repeat measurement on the belt (2 N).

3. Finalize

- Re-connect the RZ motor connection X1 at interconnection board.



D6-00002.fm

D6.2 Placement head HA, measuring friction of the Z movement

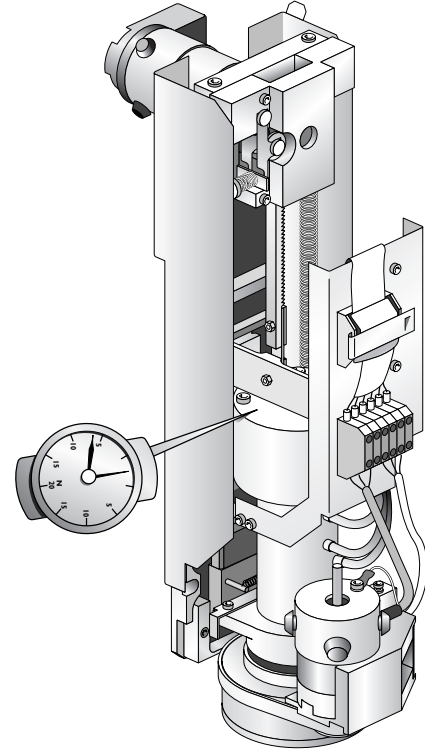
Estimated time to complete [min.]: 5
 Required special tools. Torque meter 0-20 Nm
 Required part(s)

1. Measure friction

- Disconnect the Z motor connection X7 at the manifold board.
- Remove the top screws of the tension springs.
- Hold the torque meter (20 N) against the top and bottom of the RZ bearing housing and measure the friction of the Z movement as follows:

$$Z_{friction} = \frac{UP_{movement}(-DOWN_{movement})}{2}$$

- Press the modified screwdriver into the top of the right spring and move the spring to its working position.
- Secure the spring using the top screw.
- Use the threaded end to bring the left spring into its working position, press the modified screwdriver into the spring to keep it in position.
- Remove the threaded end and secure the spring using the top screw.
- Re-connect the Z motor connection X7 at the manifold board.
- If not OK, see [D7.9 Placement head HA, checking, cleaning and lubricating](#)



D6-00003.fm

D6.3 Placement head HA, checking vacuum level

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1.

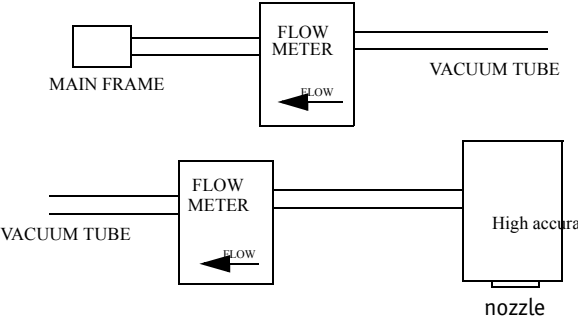
- Using the pressure tube release tool, disconnect the vacuum tube from the manifold to the placement head HA
- Connect the pressure meter to the vacuum channel from the manifold;
- Switch on vacuum and pneumatics and open vacuum valve;
- Measure vacuum on pressure meter ($- 0.85 \text{ bar} \pm 0.1 \text{ bar}$);
- Connect the air flow meter between the vacuum channel and the vacuum tube to the placement head HA;
- Switch on vacuum and pneumatics and open vacuum valve;
- At the bottom of the placement head HA, close the vacuum channel (with the end of a finger) and read the vacuum leakage (M1);
- Close the vacuum valve and measure the vacuum leakage (M2);
- Calculate the difference between M1 and M2, this should be less than 0.1;
- Using the pressure tube release tool disconnect the flow meter and re-connect system.

D6.4 Placement head HA, checking compressed and blower air

Estimated time to complete [min.]:
Required special tools.
Required part(s)

1. Checking compressed and blower air

- Measure the compressed and blower air using the same principle as the vacuum level.



D6-00005.fm

CHAPTER D7 Maintenance instructions



NOTE: Operation, adjustment, maintenance and repair of this machine shall be carried out by **qualified and trained** personnel only.

This chapter contains detailed (corrective and preventive) maintenance instructions.

The preventive maintenance intervals are defined in [A7.3 Preventive maintenance schedule](#) .

For Material Safety Data Sheets, see [A2.12 Material safety data sheets \(MSDS\)](#)

D7.1 Toolbit exchange unit, cleaning

Estimated time to complete [min.]: 2

Required special tools. Vacuum cleaner, fibre free tissues

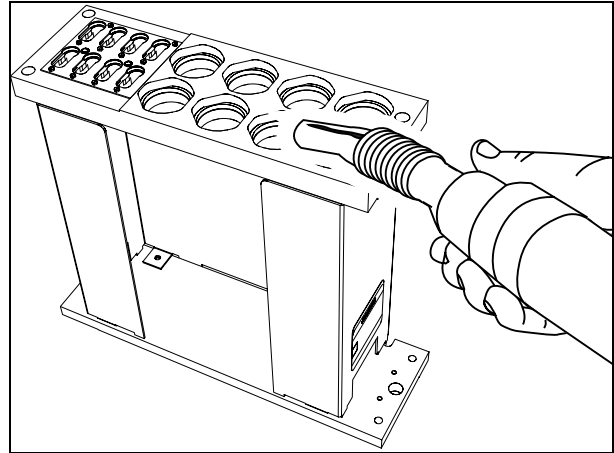
Required part(s) -

1. Prerequisites

- Clean the toolbit exchange unit from the back of the machine.

2. Cleaning the toolbit exchange unit

- Remove components, rubbish and dust with a vacuum cleaner.
- Clean the toolbit exchange unit with a fibre free tissue.



D7.2 Component reject module, cleaning

Estimated time to complete [min.]: 2

Required special tools. Vacuum cleaner, fibre free tissues

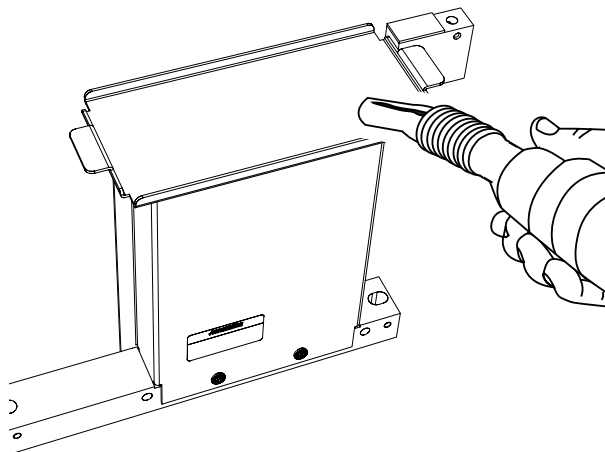
Required part(s)

1. Prerequisites

- Clean the toolbit exchange unit from the back of the machine.

2. Cleaning the reject module

- Remove components, rubbish and dust with a vacuum cleaner.
- Clean the reject module with a fibre free tissue.



D7-00012.fm

D7.3 Nozzles interface, checking cleaning

Estimated time to complete [min.]: 10

Required special tools. Ethanol, petroleum jelly

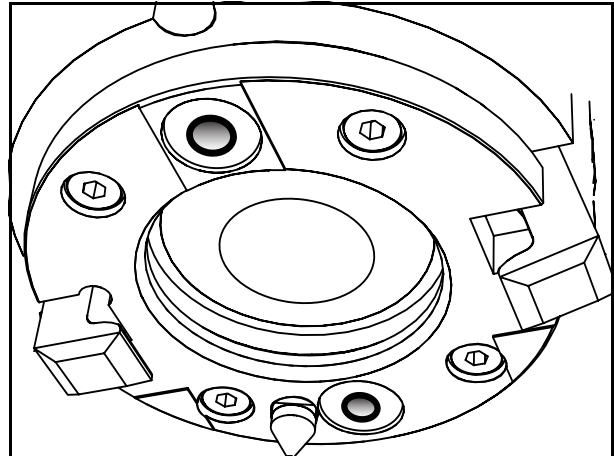
Required part(s) -

1. Prerequisites

- Remove toolbits fro placement heads.

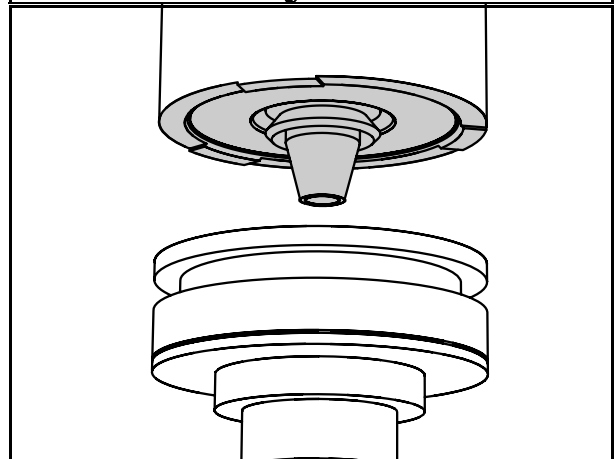
2. Cleaning and checking HA nozzle interface

- Clean with ethanol.
- Grease the two O-rings with petroleum jelly.



3. Cleaning and checking DV nozzle interface

- Clean with ethanol.
- Grease the O-rings with petroleum jelly.



D7-00009.fm

D7.4 Placement head DV, cleaning the air channel

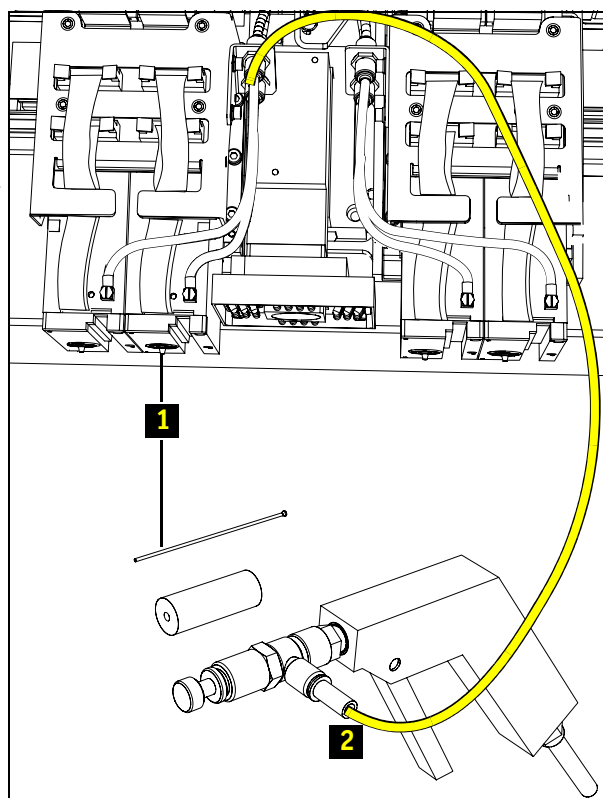
Estimated time to complete [min.]: 15
Required special tools. Set nozzle punches, see [A8.6.4](#)
Placement head cleaning tool, see [A8.6.4](#).
Required part(s) -

1. Prerequisites

- Remove the toolbit from the placement head.

2. Clean the placement head

- Use the punch (1) to loosen contamination in the vacuum channel via the toolbit holder.
- Move the white part of the placement head cleaner (2) over the outer pneumatic connection of the placement head.
- **Completely** squeeze the air gun lever several times to give air pulses of 3 – 5 seconds.
- Repeat the procedure if required.



D7.5 Placement head HA, replacing the dust catch filter in flip chip nozzle

Estimated time to complete [min.]: 3 per nozzle

Required special tools. -

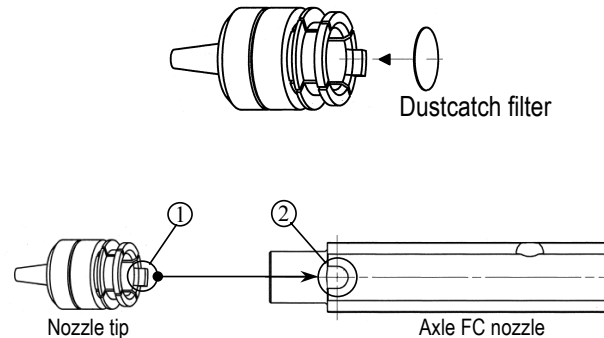
Required part(s) -

1. Replacement

- Pull the nozzle tip from the nozzle (Axle FC nozzle).

Note: Be very careful when pulling the nozzle tip from the nozzle. The edges of the nozzle tip break very easily!

- Flip the polluted filter on its side by slightly pushing against the filter with a pair of tweezers. When the filter is on its side it can easily be removed with the tweezers.
- Carefully pick up the new dust catch filter with tweezers and place it on top of the nozzle tip. Make sure the filter does not bend.
- The filter can now be pushed into the nozzle tip. Push the filter in as far as possible. This can easily be done with a 3 allen key. The top of the allen key must be plane, it may not have any sharp edges or burrs otherwise it will damage the filter.
- Check if the filter is placed correctly by keeping the nozzle tip upside down. The filter may not fall out or move.
- When the new filter is placed in the right position the nozzle tip can be replaced on the axle. When using a new nozzle tip make sure that the o-ring is placed on the nozzle tip. The nozzle tip can be placed on the axle in only one way. The point of the nozzle (1) needs to be slid in the notch (2) of the axle.



D7.6 Placement head HA, replacing the dust catch filter in nozzle

Estimated time to complete [min.]: 5 per nozzle

Required special tools. Ethanol

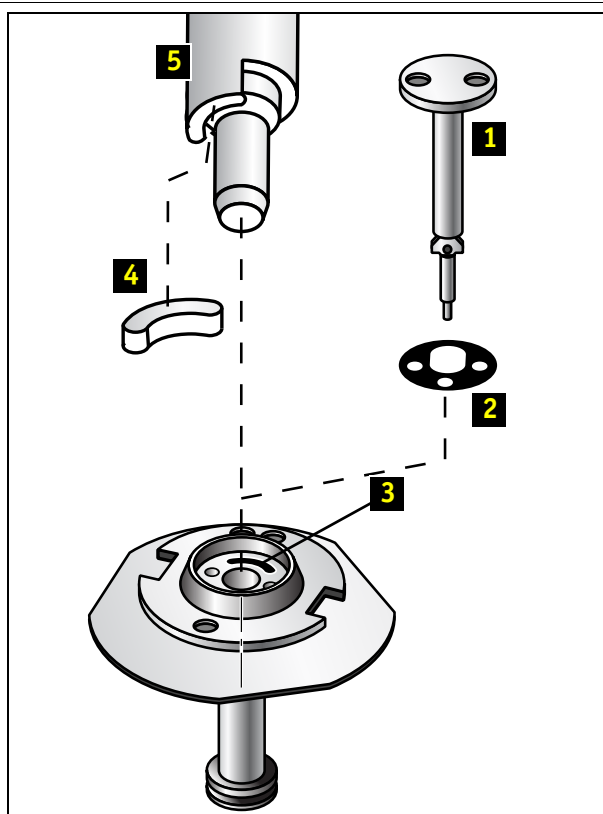
Filter replacement tool

[A8.5.3 Maintenance kit \(PA 2440/00\)](#)

Required part(s) [A8.4.9 Toolbits and gripper for placement head HA](#)

1. Replacement

- Remove the inner nozzle (1).
- Take out the rubber sealing (2).
- Remove the old dust catch filter (3) with a screw driver.
- Clean the nozzle parts with ethanol.
- Place a new dust catch filter (4) with the replacement tool (5).
- Place the rubber sealing (2). The holes in the outer nozzle must not be blocked.
- Mount the inner nozzle (1), take care for the air duct.



D7-00013.fm

D7.7 Placement head HA, replacing the carbon brushes from Z and RZ motor

Estimated time to complete [min.]: 10

Required special tools: Vacuum cleaner

Required part(s) Brushes, [A8.4.8 Placement head HA, spares](#)

This procedure is meant for **preventive** maintenance.

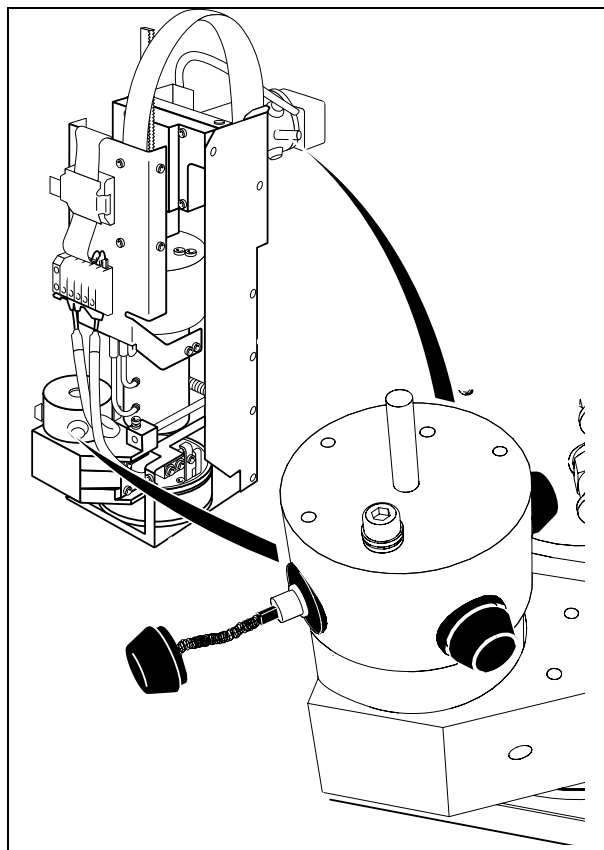
1. Prerequisites

- Remove the trolleys.
- Power down the machine.

2. Replace the carbon brushes

- Remove the old brush with a screw driver.
- Clean area with vacuum cleaner.
- Push in the new carbon brush.

Note: Take care for the spring.



D7.8 Placement head DV and Z-lift, checking, cleaning and lubricating

Estimated time to complete [min.]: 60

Required special tools. Lubrication tool with bended needles
see [A8.5.3 Maintenance kit \(PA 2440/00\)](#)

Required part(s) -

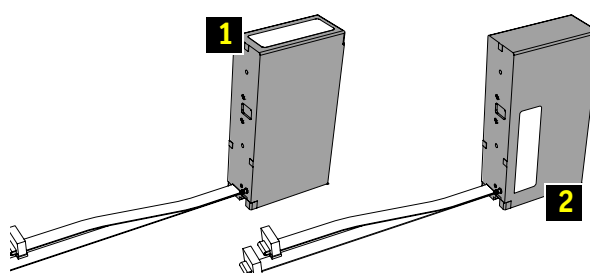


IRRITATING SUBSTANCE

Direct contact may cause irritation of the skin.
Avoid direct contact. Use Personal Protection Equipment.

1. Prerequisites

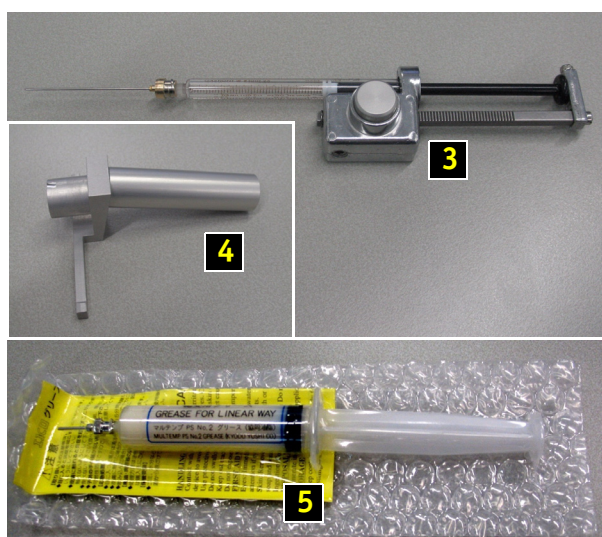
- Remove the placement heads DV, see [D8.2 Placement head DV, head replacement](#).
- Identify placement heads to be lubricated.



Lubrication needed	NO lubrication needed
ID sticker (1) placed on top of the RZ-unit	ID sticker (2) placed on the side of the RZ-unit
ID: 4022-591-054x (x = 0 - 5)	ID: 4022-591-0546

2. Placement head lubrication tools, grease

- * Lubrication-tool (3).
- * Needle guidance (4) for lubricating the placement head.
- * Syringe (5).



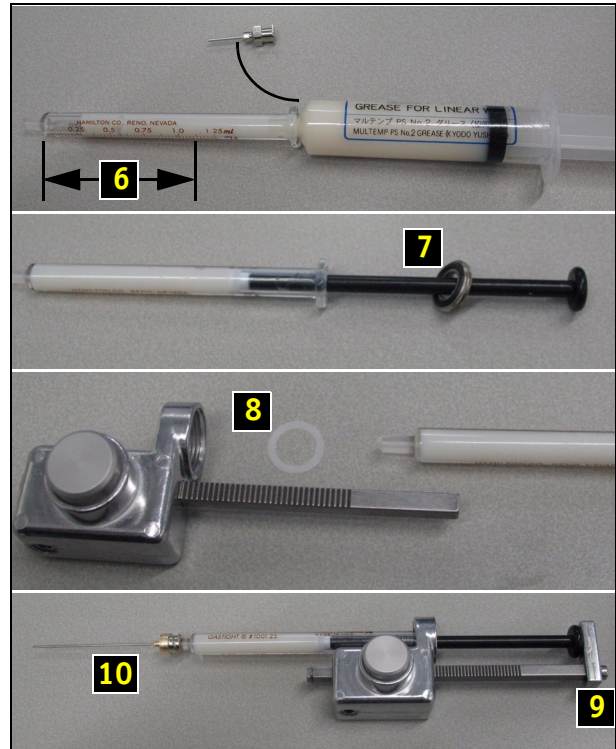
D7-00007.fm

3. Loading the lubrication tool

- Remove the needle from the syringe.
- Fill the lubrication tool container for $\frac{3}{4}$ with grease (6).

Note: Make sure no air bubbles are formed

- Put the plunger through the flange screw (7) and put the plunger in the container.
- Put the nylon ring (8) in-between the tool and the container.
- Install the container into the dispenser.
- Install the needle (10) and plunger arm (9).

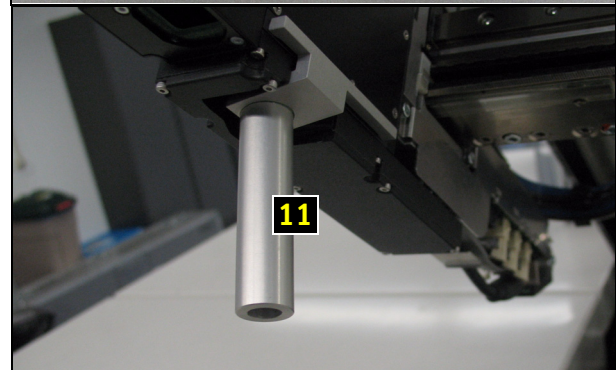


4. Place the needle guidance

- Store all toolbits.

Note: Lubrication of the placement heads can be performed with the machine powered up.

- Place the needle guidance (11) onto the placement head.

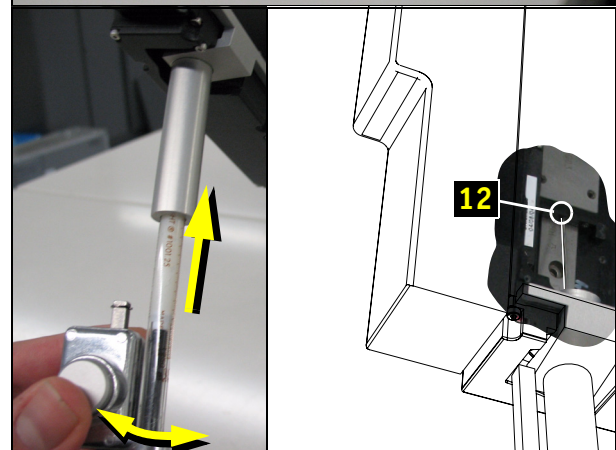


5. Insert lubrication tool

- Insert the lubrication tool through the guidance into the placement head until the needle is inside the linear guide (12).
- Rotate the lubrication tool a little to find the lubrication entry point inside the placement head.

Note: If the needle does not go all the way until the guidance, the needle is bent and must be replaced!

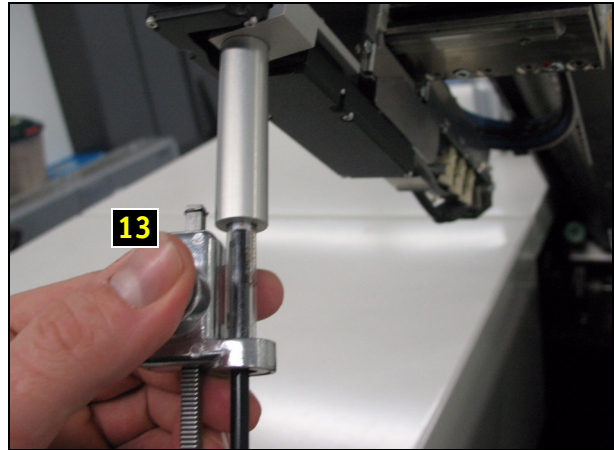
Do not move the guidance in Z-direction when the needle is inserted, this will bend the needle.



6. Lubricate the placement head

- Press the button **once** (13) to lubricate the placement head.

Do not move the guidance in Z-direction when the needle is inserted, this will bend the needle.



7. Finalize

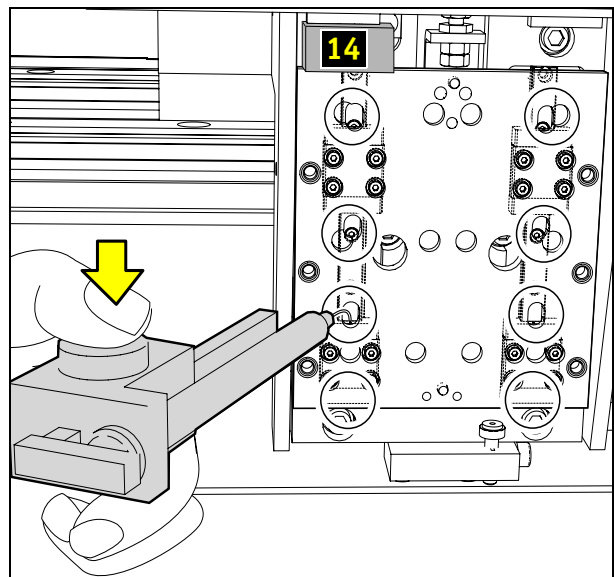
- Remove lubricating tool.
- Remove needle guidance.
- Mount toolbits.

8. Lubricate both Z-lifts

- Replace the needle with the bended one.
- Bleed the needle by pressing the button.
- Bring the Z-lift downwards with the spacer (14).
- Press the button **once**. (8 lubricating points on each Z-lift.)

9. Finalize

- Install the placement heads DV, see [D8.2 Placement head DV, head replacement](#).
- Remove the spacer (14).



D7.9 Placement head HA, checking, cleaning and lubricating

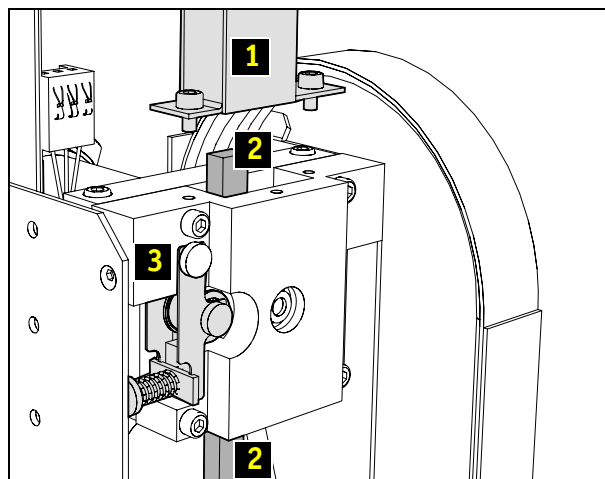
Estimated time to complete [min.]:	20
Required special tools.	Ethanol
Required part(s)	Grease, A8.5.3 Maintenance kit (PA 2440/00)

1. Prerequisites

- Remove the two rear trolleys.
- Power down the machine.

2. Z motor rack and gear

- Remove the cover (1).
- Clean the Z motor rack (2) and gear using fibre free tissue moistened with ethanol;
- Lightly lubricate the Z motor rack (2) and gear with Anti-score EP Lube;
- Check the friction of the Z movement, see [D6.2 Placement head HA, measuring friction of the Z movement](#)



3. Z Motor Rack Tensioner

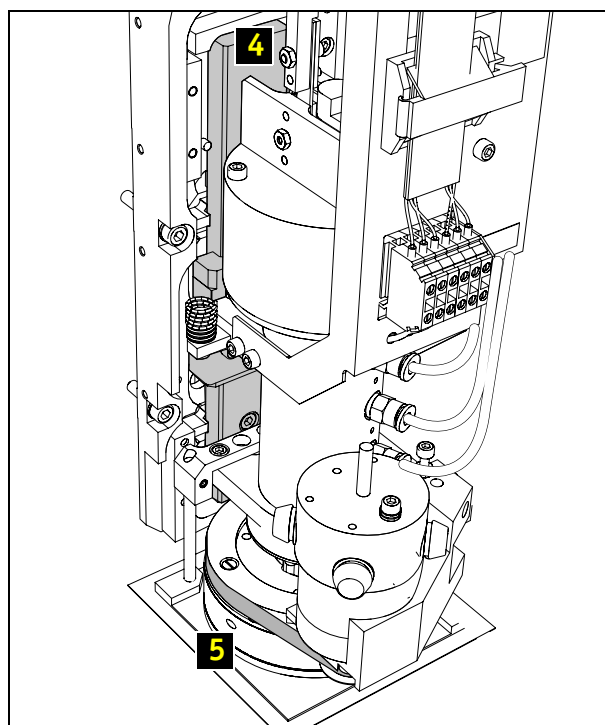
- Clean the Z motor rack tensioner (3) using fibre free tissue moistened with Ethanol;
- Lightly lubricate tensioner with Anti-score EP Lube.

4. Linear guide rail

- Clean the linear guide rail (4) using fibre free tissue moistened with Ethanol;
- Lightly lubricate the linear guide rail with Isoflex Topas NCA52.

5. RZ belt

- Measure the friction, see [D6.1 Placement head HA, measuring friction of the RZ movement](#)
- Check the RZ belt (5) for wear, replacement , see [D8.8 Placement head HA, RZ belt replacement](#) .



CHAPTER D8 Installation and replacement instructions

D8.1 Placement heads, repair policy

D8-00001.fm

D8.2 Placement head DV, head replacement

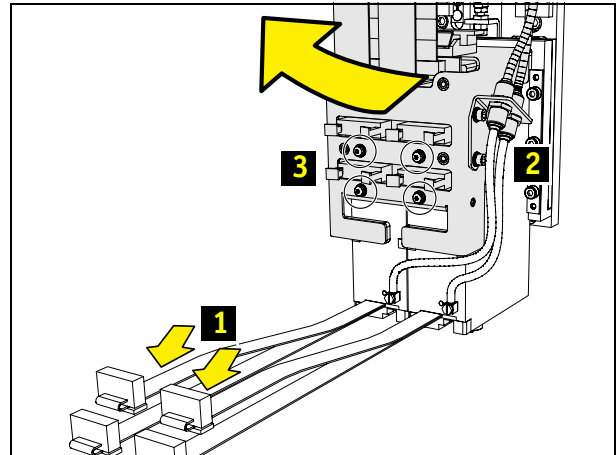
Estimated time to complete [min.]: 30

Required special tools: -

Required part(s) A8.4.10 Placement head DV, spares

1. Prerequisites

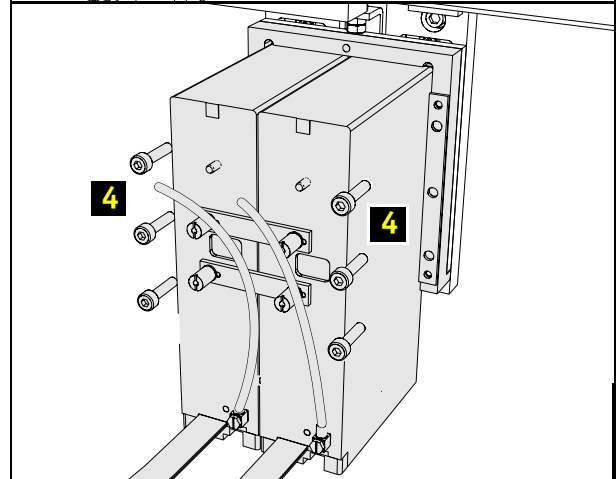
- Power down the machine.
- Disconnect the four flat cables (1).
- Disconnect the two air hoses (2).
- Remove the four screws (3) and put the bracket aside.



2. Remove placement head DV

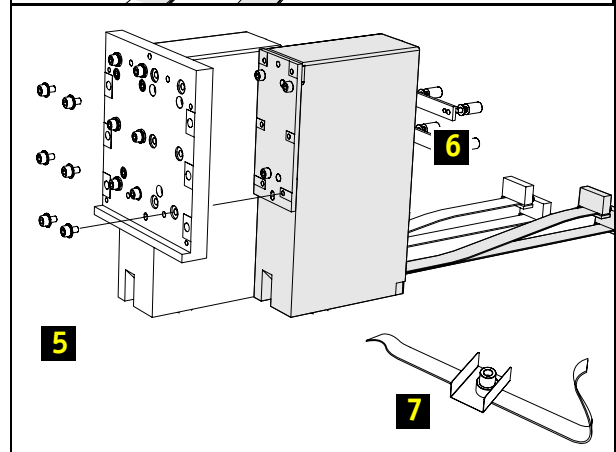
Note: Hold the placement head while removing the last bolt.

- Remove the six bolts (4).
- Pull the placement head from the dowel pins.



3. Transfer placement head

- Remove both brackets (6).
- Remove the six bolts (5) of the placement head concerned.
- Pull the placement head from the dowel pins.
- Transfer transport strap (7) from new to old placement head DV.



4. Finalize

- Assembly in reverse order.
- Tightening torque placement head bolts (5) 1.3 Nm, mounting bolts (4) 3.5 Nm.
- [A6.1.1 Exchange calibration procedure](#)

D8-00006.fm

D8.3 Placement head DV controller, replacement

Estimated time to complete [min.]: 20

Required special tools: -

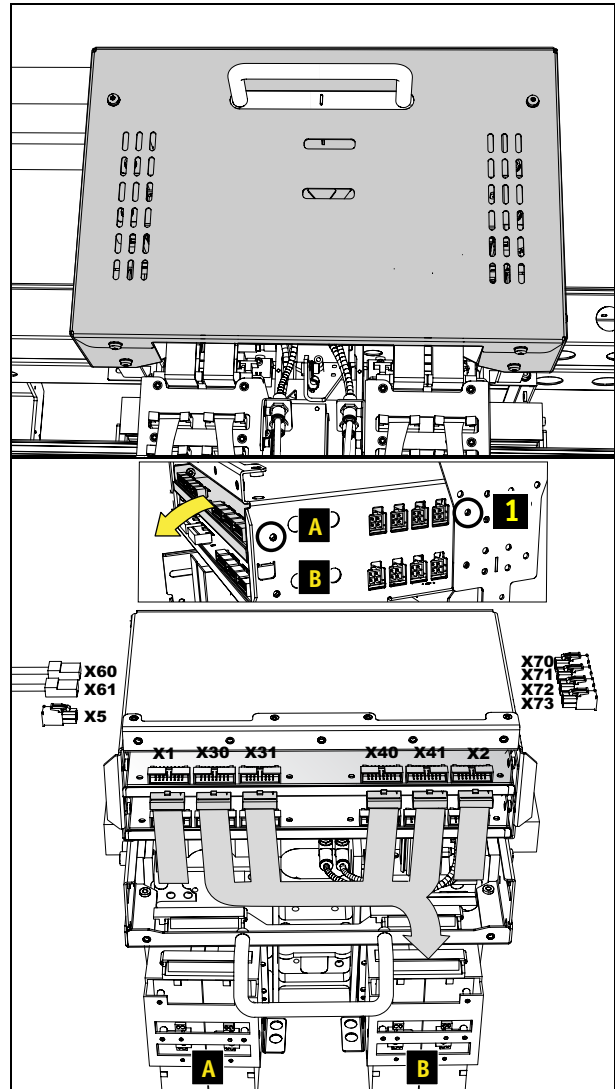
Required part(s) [A8.4.10 Placement head DV, spares](#)

1. Prerequisites

- Power down the machine.
- Remove the cover.

2. Remove placement head DV controller

- Disconnect the flat cables to get access.
- Remove connector X60, X61 and X5 on the left side.
- Remove the connectors X71 and X72 from the right side.
- Remove the BA camera cable.
- Remove the screws (1) of the controller at both sides.
- Slide out the placement head controller board.

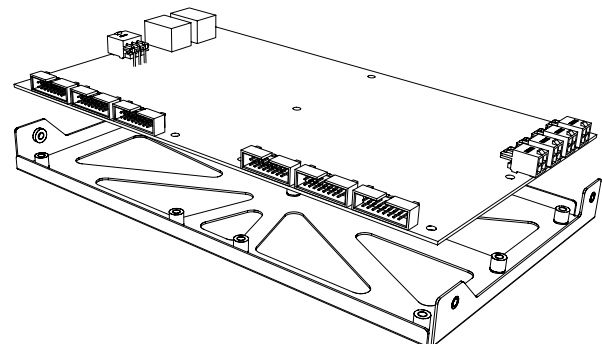


3. Transfer support

- Transfer the support to the new controller.

4. Finalize

- Installation in reverse order.



D8-00008.fm

D8.4 Z-lift, replacement

Estimated time to complete [min.]:	-
Required special tools:	Z-tool, see A8.5.3 Maintenance kit (PA 2440/00)
Required part(s)	A8.4.10 Placement head DV, spares

1. Prerequisites

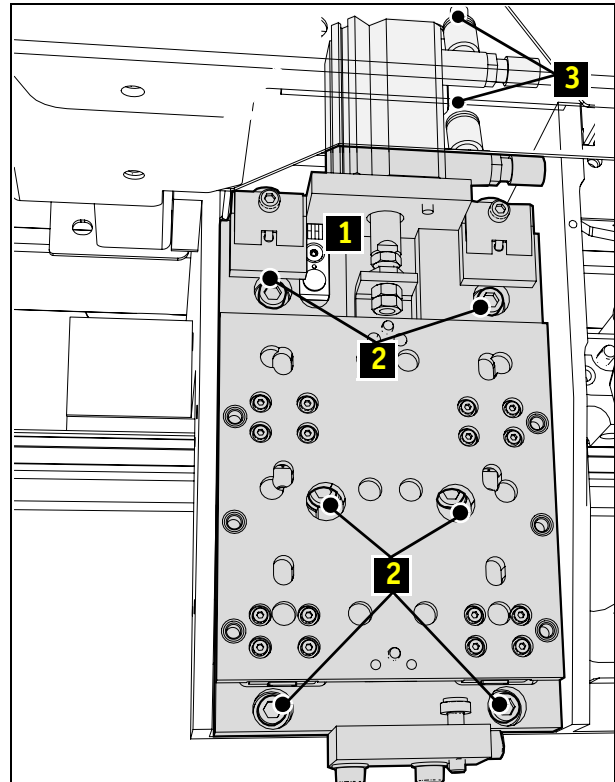
- Remove the placement heads DV, see [D8.2 Placement head DV, head replacement](#)
- Remove bracket on which the pneumatic controllers are mounted, see [D8.6 Pneumatic controller, replacement](#)

2. Remove Z-lift

- Release the sensor (1).
- Remove the six bolts (2) and take the Z-lift off.
- Disconnect the air hoses (3), and take out the sensor (1) while removing the Z-lift.

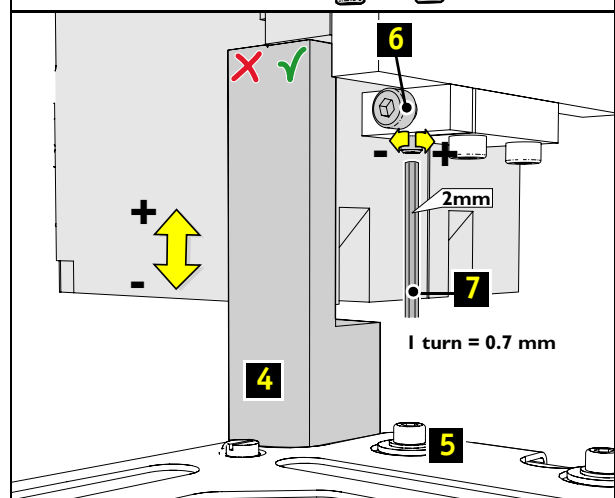
3. Install Z-lift

- Install in reverse order.
- Mount the placement heads, see [D8.2 Placement head DV, head replacement](#).



4. Adjust Z-lift

- Send the placement head downwards using the graphical user interface:
 - * Operate the Z-slide in safety mode via: Hardware maintenance and service/dual vision heads/ pneumatics.
- Place the tool (4) on the cut away of the CV camera (5) to check and adjust the distance:
 - * Loosen the bolt (6) and turn the adjustment screw (7).



D8-00014.fm

D8.5 Z-lift sensor, replacement

Estimated time to complete [min.]: -
Required special tools: -
Required part(s) A8.4.10 Placement head DV, spares

1. Prerequisites

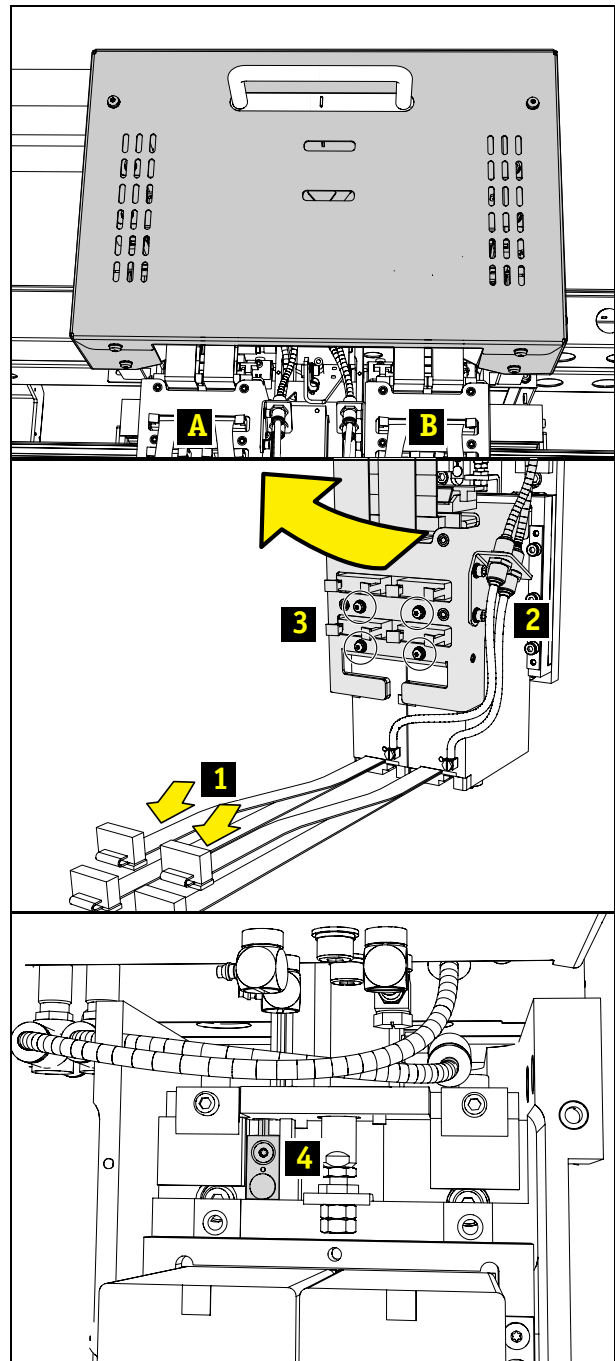
- Power down the machine.
- Remove the cover.

2. Make Z-lift sensor accessible

- Disconnect the four flat cables (1).
- Disconnect the two air hoses (2).
- Remove the four screws (3) and put the bracket aside.

3. Remove sensor from Z-lift

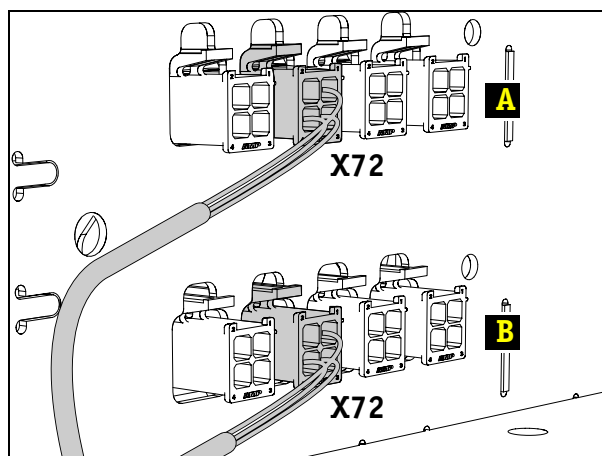
- Release sensor (4) and take it out via the slotted hole.



D8-00015.fm

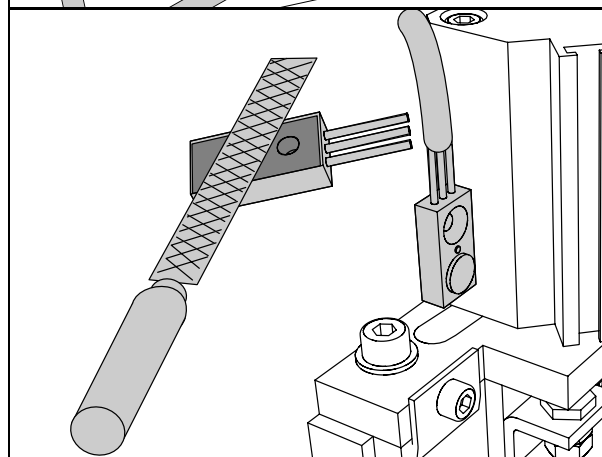
4. Remove sensor

- Remove connector from corresponding sensor (A or B, see step 1).
- Take sensor with wiring out.



5. Install new sensor

- Installation in reverse order.
- If the new sensor has burrs, the sensor can be filed at the back.



D8.6 Pneumatic controller, replacement

Estimated time to complete [min.]: 20

Required special tools. -

Required part(s) A8.4.10 Placement head DV, spares



ESD SENSITIVE ELECTRONICS

Electro Static Discharge may cause damage to electronics.

Work in an ESD safe environment or use ESD preventive measures.

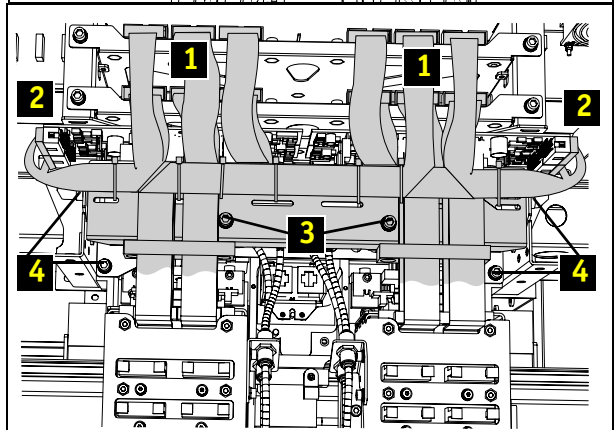
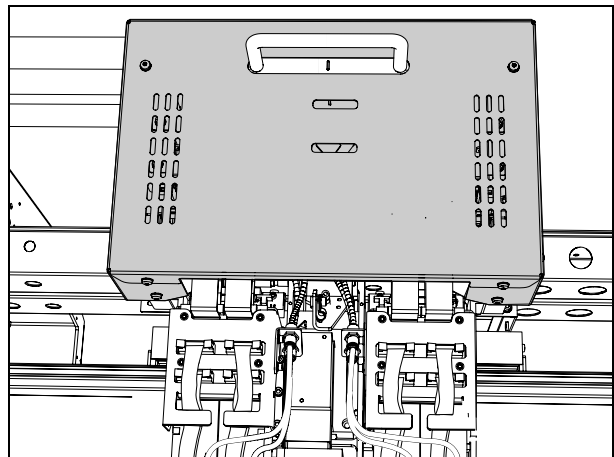
1. Prerequisites

Note: Power down of the machine is **not** necessary during the exchange procedure.

- Shut down the air supply by closing the main valve.
- Remove the protection cover.

2. Remove connectors

- Disconnect the 12 flat cables (1).
- Disconnect the four flat cables (2) (two on the left side and two on the right side)
- Remove the two bolts (3) and put bracket with wiring aside.
- Remove bolts (4) of the console.

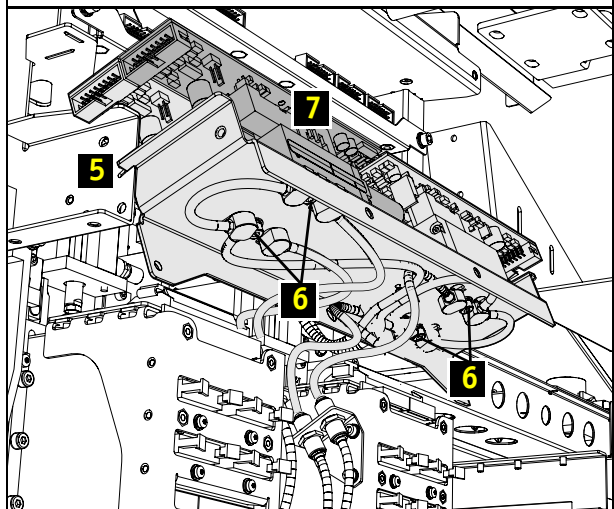


3. Exchange pneumatic controller

- Take out the bracket with the pneumatic controllers and put it in the slot (5).
- Remove the bolt (6) and take the concerning pneumatic controller (7) out.
- Check if the rubber rings on both nipples are in place and undamaged.

4. Finalize

- Assembly in reverse order.
- Avoid bending of the air hoses.



D8-00002.fm

D8.6.1 Pneumatic controller, valve, silencer or board replacement

Estimated time to complete [min.]: 5

Required special tools: -

Required part(s) A8.4.10 Placement head DV, spares

1. Prerequisites

- Remove the pneumatic controller, see [D8.6 Pneumatic controller, replacement](#)

2. Replace silencer

- Clean area around silencer.
- Replace silencer (8).

3. Separate board from valve housing

- Remove the mounting bolts (1), and separate the board (2) with the sensor housing (3) carefully from the venturi (6) and valves (4).
- Be careful not to lose the O-ring (5).

4. Replace circuit board and/or valve

- To remove the valve (4), loosen the two screws that attach it to the venturi (6).
- Always use the new rubber seal (7) that comes with the new valve.

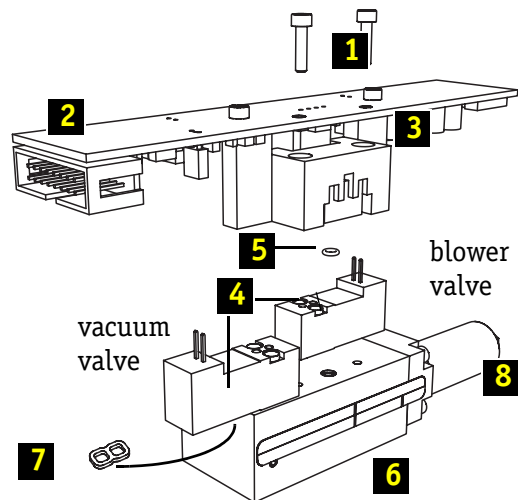
5. Assemble board and valve housing

- Assemble the pneumatic controller carefully.

Note: Incorrect mounting can damage the pins; make sure all pins are in their sockets. The pins on the valve housing bend easily; use tweezers to guide the pins into their sockets.

6. Finalize

- Install the pneumatic controller, see [D8.6 Pneumatic controller, replacement](#) .



D8.7 Placement head HA, replacement

Estimated time to complete [min.]:	15
Required special tools.	Calibarion nozzle
Required part(s)	A8.4.8 Placement head HA, spares

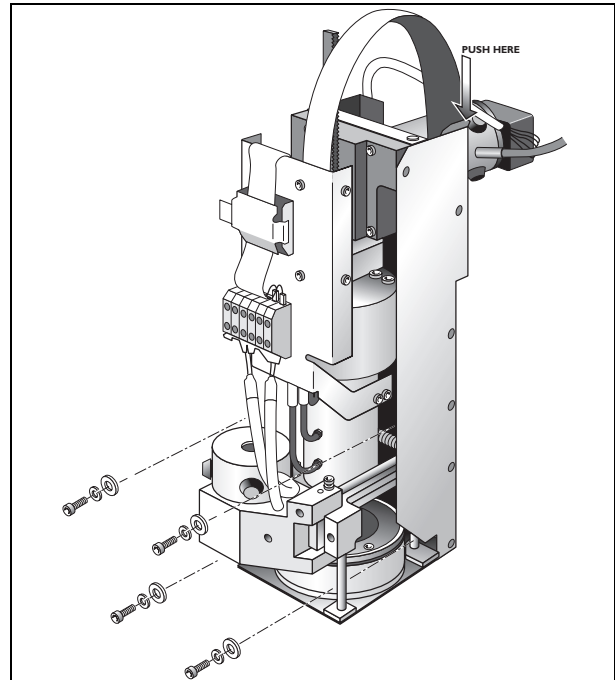
1. Prerequisites

- Power down the machine.

2. Dismantling

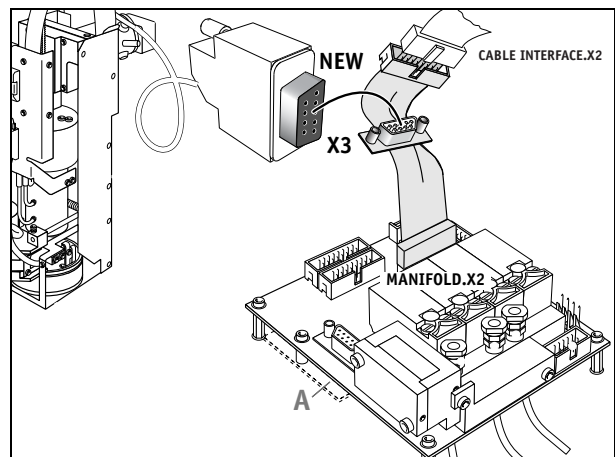
- Remove cover of manifolds.
- Disconnect the vacuum and pneumatic connections.
- Disconnect the electrical connectors.
- Support the placement head, remove the screws and note positions of screws (top screws are longer than bottom screws).

Note: Placement heads HA are supplied with a new type RZ encoder. With this new encoder the interpolator board (A) is not necessary any more.
The new type placement head can not be connected directly to the manifold (see step 4). In every packaging an extra cable is added to connect the placement head.



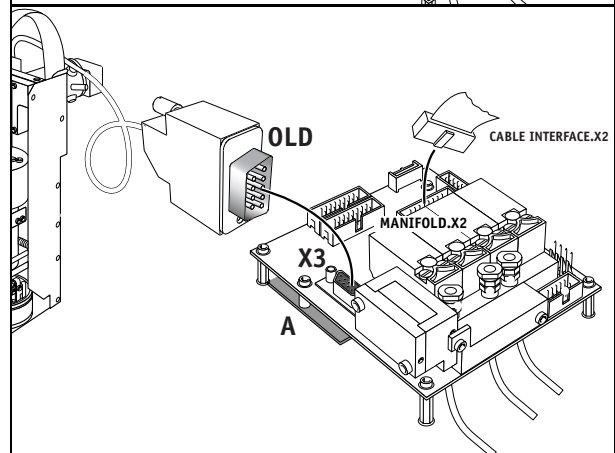
3. Placement head with new type RZ encoder

- Remove the cable from connector X2 from the manifold.
- Connect the cable between X2 from the manifold and X2 from the cable interface.
- Connect the cable with tie wraps to the frame.
- Install the new placement head.
- Install all connectors to the manifold board except the connector X3.
- Connect connector X3 from the placement head to the cable.



4. Placement head with old type RZ encoder

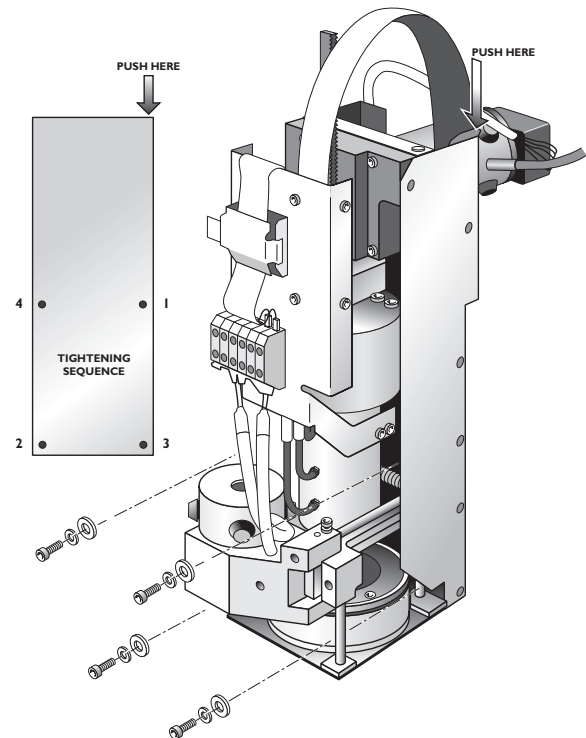
- Check if the interpolator board (A) is available (This board is necessary for old encoders!)
- Remove the cable and connect the cable interface direct to the X2 connector from the manifold.
- Store the cable for later purpose.



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5. Assembly

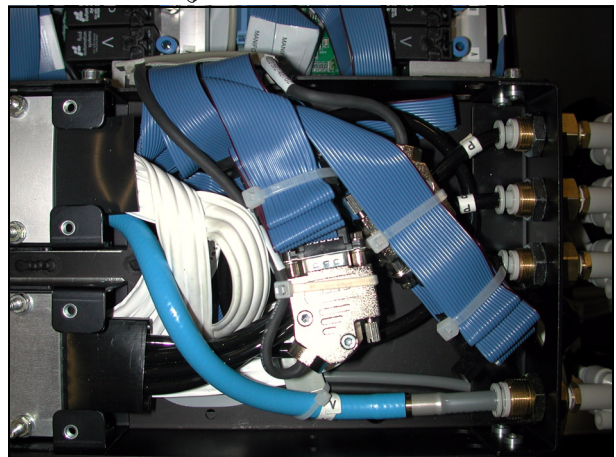
- Hand-tighten all four screws (top screws **M4x20**, bottom screws **M4x12**).
- Do not forget the washers.
- Torque tighten screws to 3.5 Nm in the given sequence and push the placement head in the direction as displayed in picture.



6. Secure cabling of placement head

Picture shows cabling of placement head with new type RZ encoder:

- Secure the cabling according picture.
- Connect the tie-wraps to the underlying tie-wraps to bring down the cabling.



7. Finalize

- Place the calibration nozzle.
- Calibrate the placement head HA. see [A6.1.1 Exchange calibration procedure](#)

D8.8 Placement head HA, RZ belt replacement

Estimated time to complete [min.]: -
Required special tools: Feeler gauges
Required part(s) Belt, [A8.4.8 Placement head HA, spares](#)

1. Dismantling

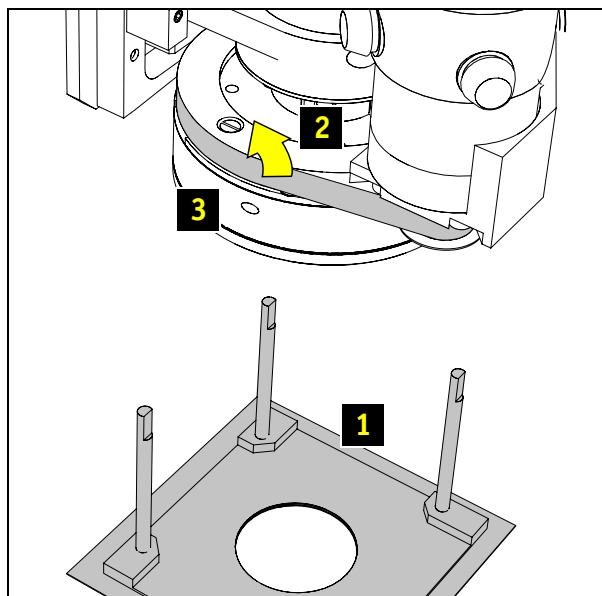
- Loosen the three screws and remove the blue plate (1).

2. Replace the RZ belt

- Turn the force control unit (3) and push the RZ belt in an upwards direction (2) at the same time.
- Move the placement head in its lowest position and remove the RZ belt.

3. Finalize

- Assembly is in the reverse order of removal.
- Check the belt tension, see [D6.1 Placement head HA, measuring friction of the RZ movement](#)
- The blue plate (1) must be installed with a play of 0.5 ± 0.3 mm between blue plate (1) and force control unit (3).



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D8.9 Placement head HA controller, replacement

Estimated time to complete [min.]:

Required special tools. Calibration nozzle

Required part(s) [A8.4.8 Placement head HA, spares](#)

1. Prerequisites

- Switch off factory power supplies and disconnect factory power connector.

2. Dismantling

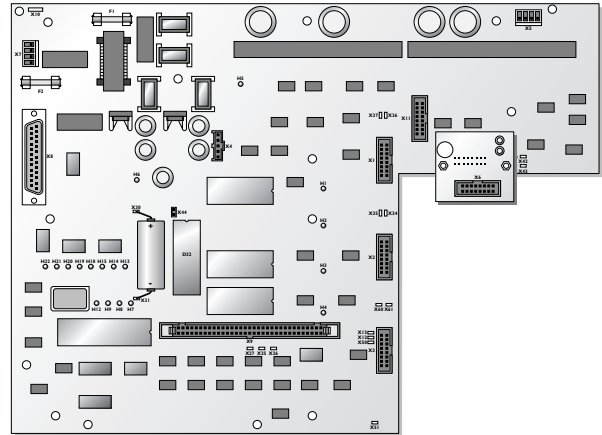
- Identify and disconnect the cables X1 up to X8.

3. Assembly

- Set Jumper X44 before installing the new controller.
- Re-connect the cables X1 up to X8.
- Switch on the machine.

4. Calibrating

- Place the calibration nozzle.
- Calibrate the placement head HA. see [A6.1.1 Exchange calibration procedure](#)
- Back-up the system data onto a USB stick.



D8.10 Manifold board, replacement

Estimated time to complete [min.]:

Required special tools. Calibration nozzle

Required part(s) A8.4.8 Placement head HA, spares

1. Prerequisites

- Switch off factory vacuum and pneumatic system supply and vent system

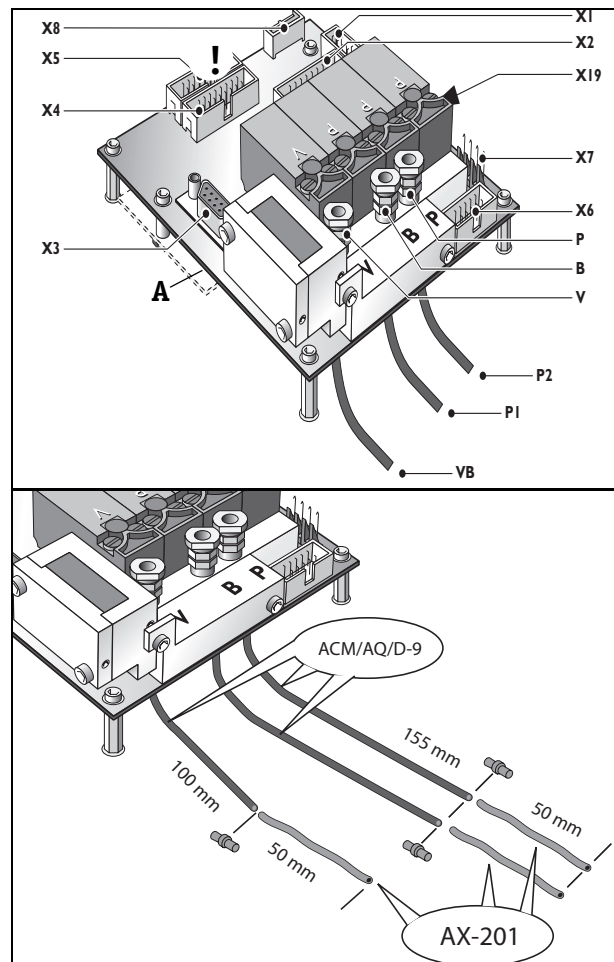
2. Dismantling

- Identify and disconnect vacuum and pressure connections P, B, V, P1, P2 and VB;
- Identify and disconnect electrical connections X1 to X8 and X19.

Note: If X3 was connected, transfer the interpolator board (A) to the new manifold board, see also [D8.7 Placement head HA, replacement](#)

3. Adapt hose length

- Adapt the hose length according picture.



4. Assembly

- Assembly is in the reverse order of removal,
- Place the calibration nozzle.
- Calibrate the placement head HA. see [A6.1.1 Exchange calibration procedure](#)

WARNING: Do not mix up the connectors X4 and X5!

Note: Check if the hoses are not bent under the board.

D8.10.1 Manifold board, pressure sensor 26PC and reference sensor replacement

Estimated time to complete [min.]:

Required special tools. Calibration nozzle

Required part(s) [A8.4.8 Placement head HA, spares](#)

1. Prerequisites

- Switch off factory vacuum and pneumatic system supply and vent system.

2. Dismantling

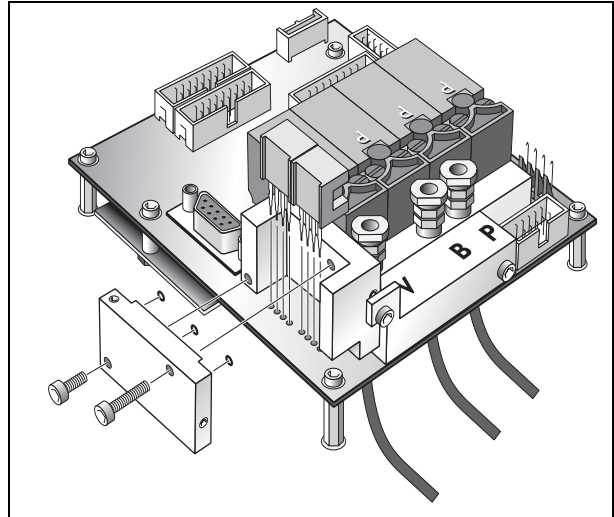
- Remove two screws and securing plate;
- Identify electrical orientation of the sensors and remove the sensors from the manifold (the right sensor is the reference sensor and the left sensor is the pressure sensor).

3. Assembly

- Assembly is in the reverse order of removal however;
- Note electrical orientation of sensor and use a new o-ring;

4. Calibrating

- Place the calibration nozzle.
- Calibrate the placement head HA. see [A6.1.1 Exchange calibration procedure](#)
- Back-up the system data onto an USB stick.
- Enable X44.





Service Manual

Feeder Trolley A-series

Document	Service Manual, Feeder Trolley A-series
Based on	-
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Supplied with.	PA 2631/XX
.	PA 2632/XX

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E. FEEDER TROLLEY

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CHAPTER E1 Introduction

E1.1 General

The trolley is a cart that forms the interface between the feeders and the base. Feeders are placed on the trolleys and the trolleys are mounted on the base.

This part of the manual also covers the trolley lift cover, because it uses the same interface on the base.

E1.2 Survey

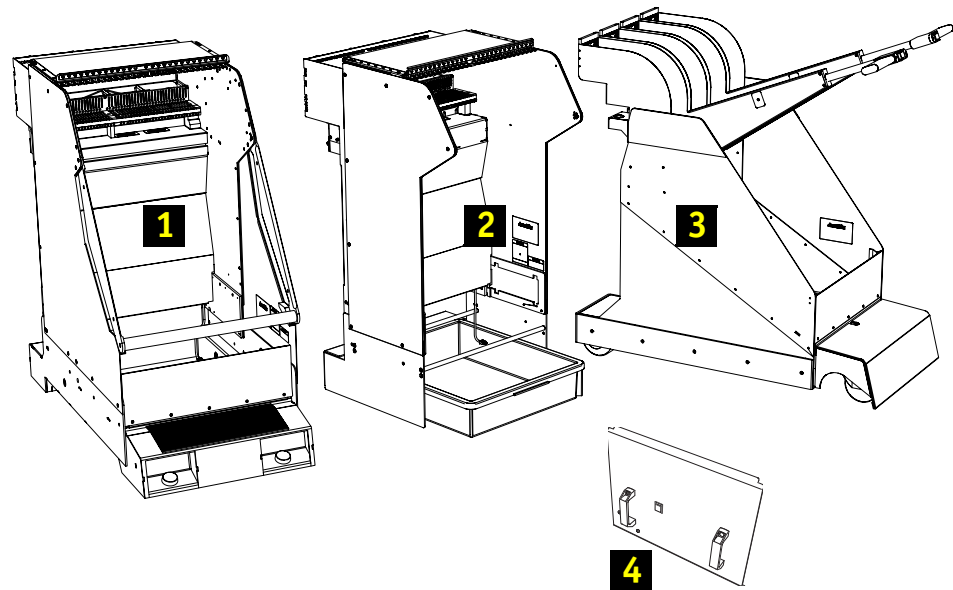


Figure 1 Feeder trolley and safety cover

Content of this part:

1. A-series feeder trolley (including optional tape cutter)
2. A-series feeder bank
3. Upgraded FCM feeder trolley / FCM feeder trolley for the AX-3/5 and 301/501
4. Trolley lift cover.

CHAPTER E2 Safety and ergonomics

The trolleys (and trolley lift cover) are part of the whole machine.

Safety and ergonomics is only described for the machine as a whole.

- AX-201, see [CHAPTER A2 Safety](#)
- AX-301/501/3/5, see [CHAPTER A2 Safety](#) .

CHAPTER E3 Specifications

E3.1 A-series feeder trolley, identification

The trolley identification plates are located inside the trolley.

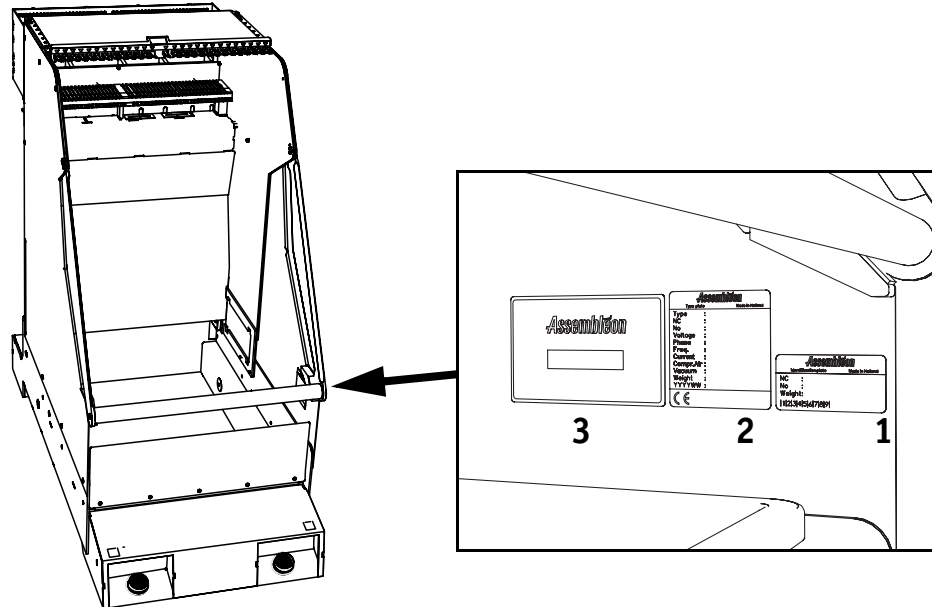


Figure 2 Identification plates on the A-series feeder trolley

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number: 2632/00 (with first version tape cutter, see E3.3) Project number 9466-920-10631 (without tape cutter) 6 digit PA-number: 2632/05 (without tape cutter) 6 digit PA-number: 2632/06 (without tape cutter) 6 digit PA-number: 2632/15 (with 2nd version tape cutter, see E3.3) 6 digit PA-number: 2632/16 (with 2nd version tape cutter, see E3.3) 6 digit DC-number.
3	Service identification	5 digit M-number.

Figure 3 Identification plates on trolley

E3.2 A-series feeder trolley, air upgrade identification

The A-series trolley upgrade air identification plates are located inside the trolley.

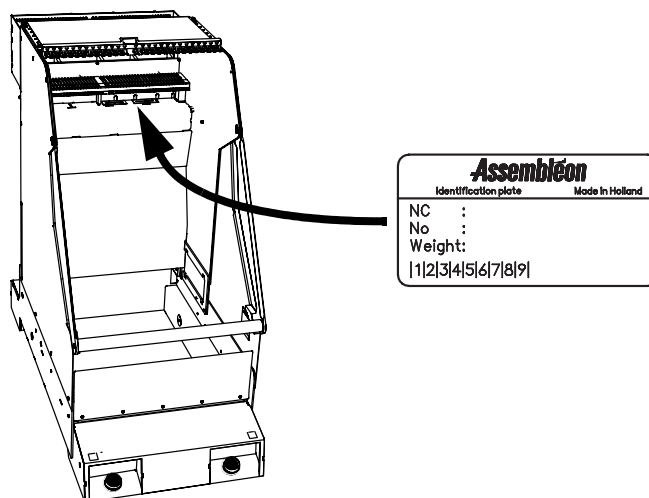


Figure 4 Identification plates on A-series trolley air upgrade

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number: 2632/10 6 digit PA-number: 2632/11 6 digit DC-number.

E3.3 A-series feeder trolley, tape cutter identification

Tape cutters exist in two different technical versions.

The tape cutter identification plates are located inside the trolley.

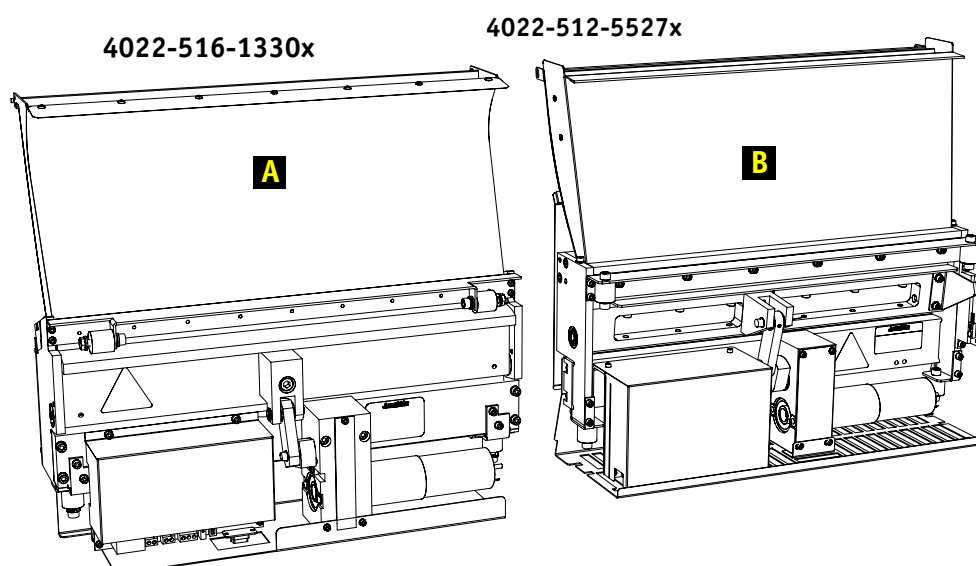


Figure 5 Tape cutters, overview

- Tape cutter as part of the A-series feeder trolley PA 2632/15, or as upgrade PA 2632/20.
- Tape cutter as part of the A-series feeder trolley PA 2632/00.

E03.fm

E3.4 FCM trolley for AX-3/5 and AX-301/501, identification

The trolley identification plates are located inside the trolley.

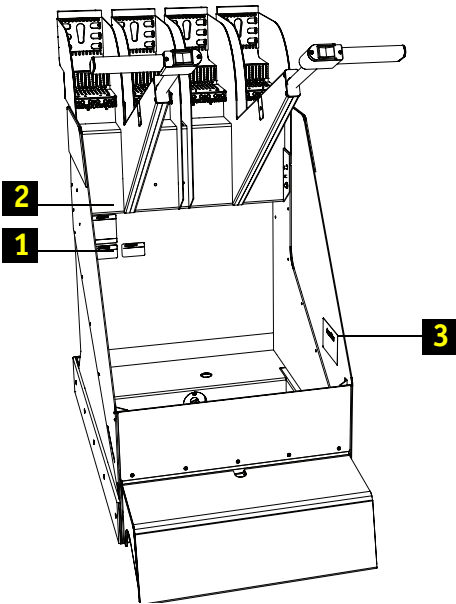


Figure 6 Identification plates on the upgraded FCM trolley for AX-3/5 and AX-301/501

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number: 2631/10 6 digit DC-number.
3	Service identification	5 digit M-number.

Figure 7 Identification plates on trolley

E3.5 Upgraded FCM feeder trolley for AX-3/5 and AX-301/501, identification

The trolley identification plates are located inside the trolley.

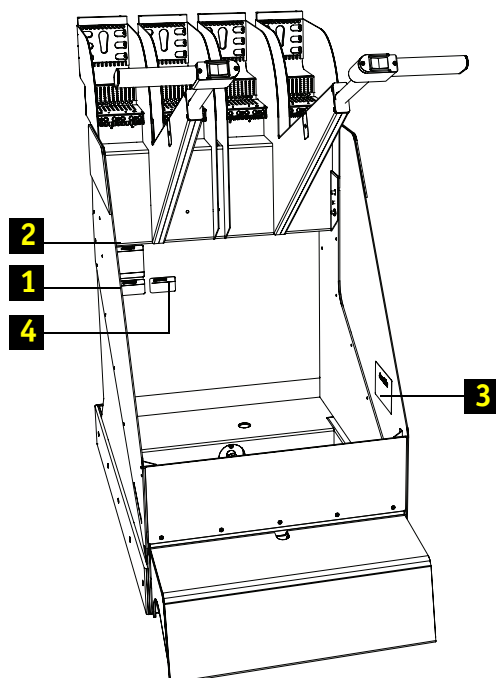


Figure 8 Identification plates on the upgraded FCM feeder trolley

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number: 2631/00 6 digit DC-number.
3	Service identification	5 digit M-number.
4	Commercial identification	AX FCM-II trolley upgrade (PA 2631/50)

Figure 9 Identification plates on trolley

E3.5.1 A-series feeder bank, identification

The feeder bank identification plates are located inside the feeder bank.

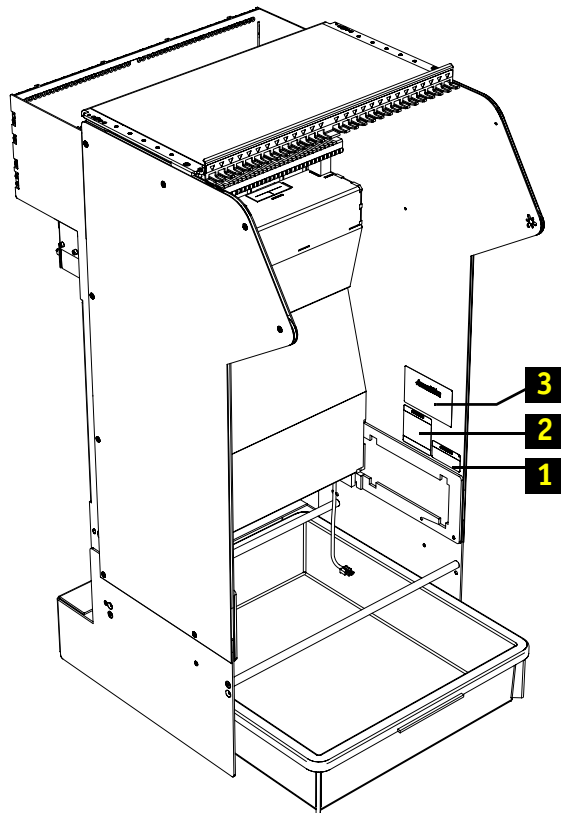


Figure 10 Feeder bank

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number: 2636/00 6 digit PA-number: 2636/01 6 digit DC-number.
3	Service identification	5 digit M-number.

Figure 11 Identification plates on feeder bank

CHAPTER E4 Functional description

E4.1 A-series feeder trolley

The trolley is a cart that is designed to realise a quick change over to another feeder set-up.

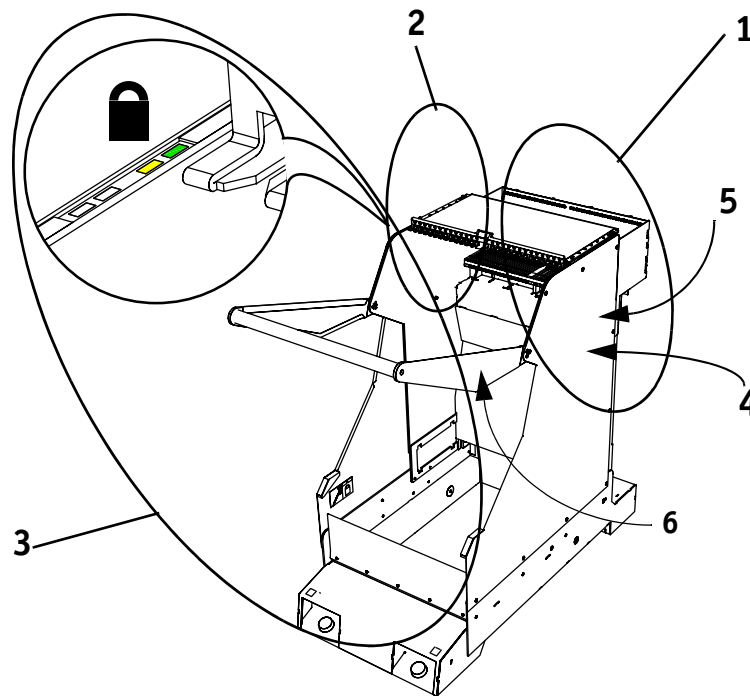


Figure 12 Functional units on trolley

1. Base interface, see [E4.1.1](#)
2. Feeder interface, see [E4.1.2](#)
3. Human interface, see [E4.1.4](#)
4. Electronics, see [E4.1.5](#)
5. SVS-Pro, see [E4.1.6](#).
6. Tape cutter (optional), see [E4.1.8](#)

E4.1.1 Base interface

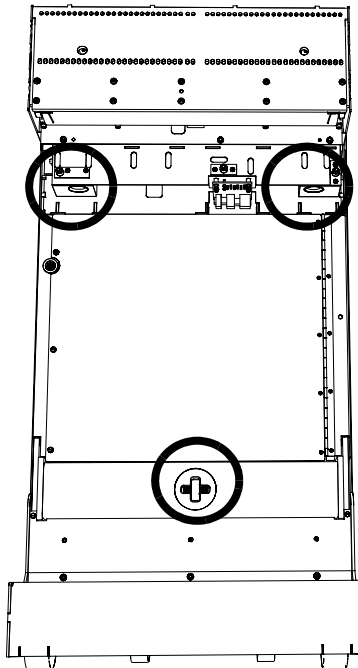


Figure 13 Base interface

The base interface on the trolley enables that the trolley is lifted by the trolley lift and it guarantees that the trolley is mechanically correctly positioned on the base.

When the trolley lift is in the upper position, power (24 VDC), air pressure (5.9 bar) and communication signals are passed from the base to the trolley using the base interface.

E4.1.2 Feeder interface

The feeder interface on the trolley supplies:

- A stable mechanical interface. Part of the mechanical interface is the topguide that enables easy feeder placement.
- Power to the feeders (12 VDC).
- Compressed air to the feeders (5.9 bar), this is only applicable if the A-series trolley upgrade air has been installed.
- Communication signals to the feeders.
- Support for feeders with shiftable topguides.
- 27 feeder slots on each trolley.

A wide range of feeders can be mounted on the trolley. On the trolley the following combinations of feeder types can be mounted:

Feeder	AX-301/501		AQ/ AX-201
	Compact placement robot	Standard placement robot	
Twin bulk feeder (TBF)	5 (10 components)	13 (26 components)	Not applicable
Twin tape feeder (TTF)	6 (11 components)	13 (26 components)	24 (48 components)
ITF2-8mm (ITF08)	5	13	24
ITF12SV	5	13	24
ITF2-12mm (ITF12)	4	9	17
ITF2-16mm (ITF16)	4	9	16
ITF2-24mm (ITF24)	3	6	12
ITF2-32mm (ITF32)	2	5	9
ITF2-44mm (ITF44)	2	4	7
ITF2-56mm (ITF56)	3 x 1 (per trolley)** 1 x 2 (per trolley)**	3	6

**Due to the asymmetric layout of the feeder trolley, there can be a difference in the maximum amount of components numbers between a two compact placement robots next to each other or two standard placement robots next to each other within the same trolley.

Figure 14 Maximum number of feeders on A-series feeder trolley

E4.1.3 Markers

The pick and place module measures the markers to determine the exact position of the feeder slots on the trolley.

E4.1.4 Human interface

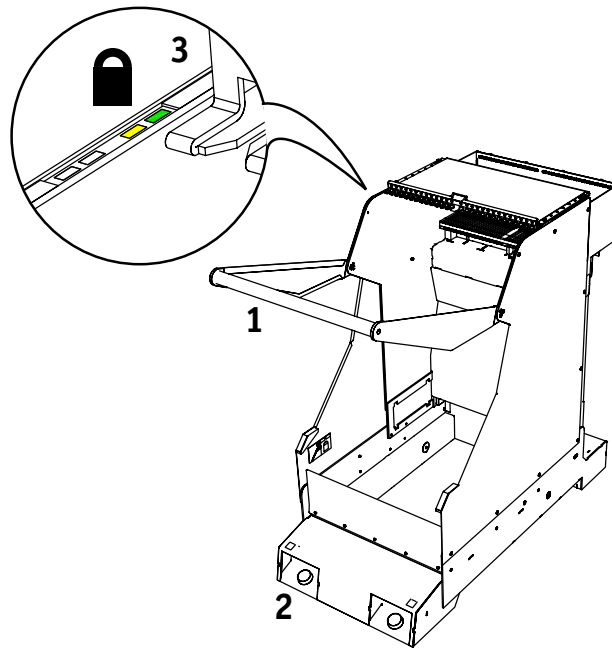


Figure 15 Human interface of the A-series feeder trolley

1. HandleUsed to manoeuvre the trolley against the trolley lift on the base.
2. Foot switchesUsed to activate the trolley lift.
3. IndicatorsDisplay status of trolley.

E4.1.5 Electronics

When the trolley lift is in the upper position the base interface board on the trolley lift makes contact with the trolley interface board on the trolley. The trolley connecting board feeds the 24 VDC (supplied by the base) to the power converter. The power converter converts the 24 V to 12 VDC. This voltage is fed via the trolley connecting board to the feeder interface board.

E4.1.6 SVS-Pro support

The A-series trolley supports SVS-Pro, for more information see the SVS-Pro option manual.

E4.1.7 Height adjustment

The A-series feeder trolley supports two height ranges:

- SMEMA (Surface Mount Equipment Manufacturers Association) ($952.5 \text{ mm} \pm 12.7 \text{ mm}$).
- JIS (Japanese Industrial Standard) ($900 \pm 15 \text{ mm}$).

The height adjustment procedure can be found in [E6.1](#).

E4.1.8 Tape cutter

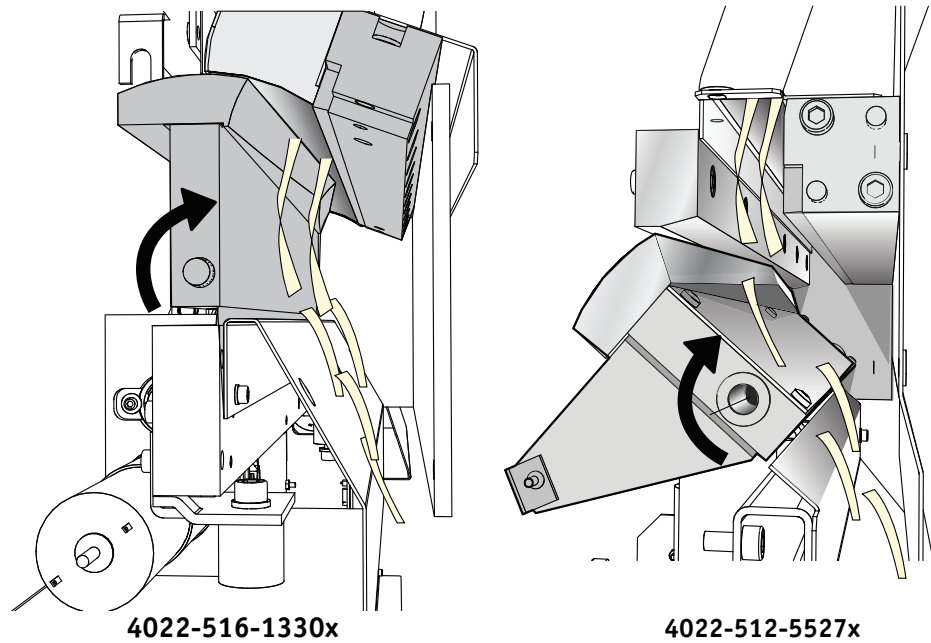


Figure 16 Tape cutter, cross-section

The feeder trolley is or can be equipped with a tape cutter to minimize manual tape waste removal and improve ergonomics for the operator.

The tape cutter is designed to cut carrier tape (top foil has to be cut manually).

E4.2 FCM trolley, upgraded FCM trolley for AX-3/5, AX-301/501

The trolley is a cart that is designed to realise a quick change over to another feeder set-up.



NOTE: The 'upgraded FCM trolley' and the 'upgraded FCM trolley for AX' are technically the same.

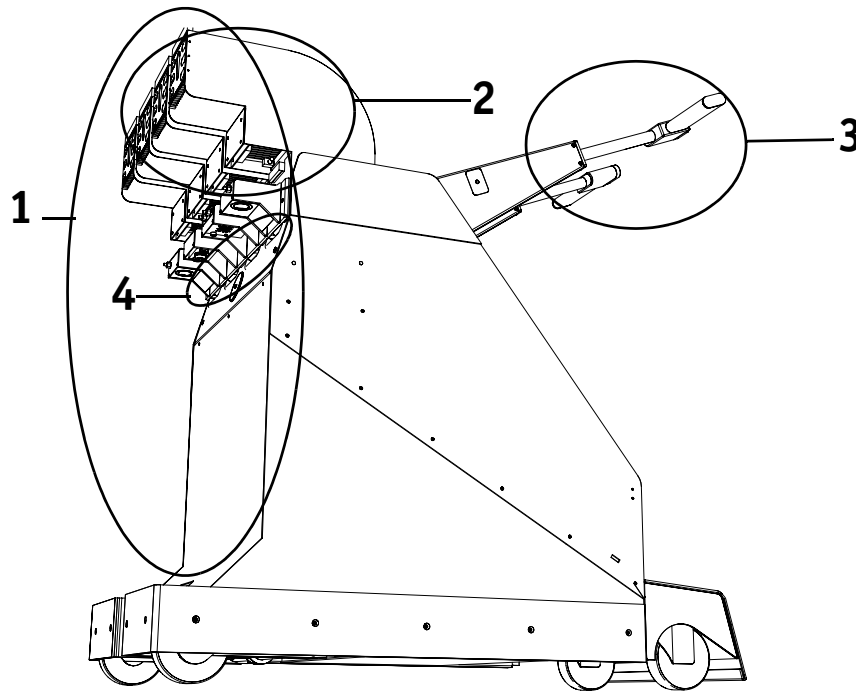


Figure 17 Functional units on trolley

1. Base interface.
2. Feeder interface.
3. Handles.
4. Electronics.

E4.2.1 Base interface

The base interface on the trolley enables that the trolley is lifted by the trolley lift and it guarantees that the trolley is mechanically correctly positioned on the base. On a AX-301 three trolleys can be mounted, and five trolleys on an AX-501, so every trolley covers four robot-slots on a base.

When the trolley lift is in the upper position power (24 VDC) and air pressure (5.9 bar) is passed from the base to the trolley using the base interface.

E4.2.2 Feeder interface

The feeder interface on the trolley supplies:

- A stable mechanical interface.
- Power to the feeders (12 VDC).
- Compressed air to the feeders (5.9 bar).

A wide range of feeders can be mounted on the trolley.

For every robot-slot on a base 11 feeder positions exist.

On these 11 feeder positions the following combinations of feeder types can be mounted.

Feeder type							
8mm tape (including twin tape) or twin bulk	12 mm tape	16 mm tape	24 mm tape	32 mm tape	44 mm tape	56 mm tape	restrictions
6 (max)	0	0	0	0	0	0	
4	1	0	0	0	0	0	
2	2	0	0	0	0	0	
1	3 (max)	0	0	0	0	0	1)
1	2	1	0	0	0	0	
1	1	2	0	0	0	0	
1	0	3 (max)	0	0	0	0	
0	0	2	1	0	0	0	
0	1	1	1	0	0	0	
0	2	0	1	0	0	0	
0	0	1	2	0	0	0	
0	1	0	2	0	0	0	
0	0	0	3 (max)	0	0	0	
0	0	0	1	1	0	0	
0	0	0	0	2 (max)	0	0	
1	0	0	0	0	1	0	
0	1	0	0	0	1	0	
0	0	1	0	0	1	0	
0	0	0	1	0	1	0	
0	0	0	0	1	1 (max)	0	2)
0	0	0	0	0	0	1 (max)	

Figure 18 Feeder types

1. In this feeder combination only the following sequence is possible: the 8 mm tape feeder or twin bulk feeder should be mounted on the most left position.
2. In this feeder combination only the following sequence is possible: the 32 mm tape feeder should be mounted on the most left position.

E4.2.3 Handles

The trolley is provided with two extensible handles, by which the trolley can be manoeuvred against the trolley lift on the base.

In the handles 2 sets of up/down switches are mounted. When both switches are pushed at the same time, the trolley lift is activated.

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E4.2.4 Electronics

In the upper position of the trolley lift the base interface board on the trolley lift makes contact with the trolley interface board on the trolley. The trolley connecting board feeds the 24 VDC (supplied by the base) to the power converter. The power converter converts the 24 V to 12 VDC. This voltage is fed via the trolley connecting board to the 4 feeder interface boards.

E4.3 Trolley lift cover

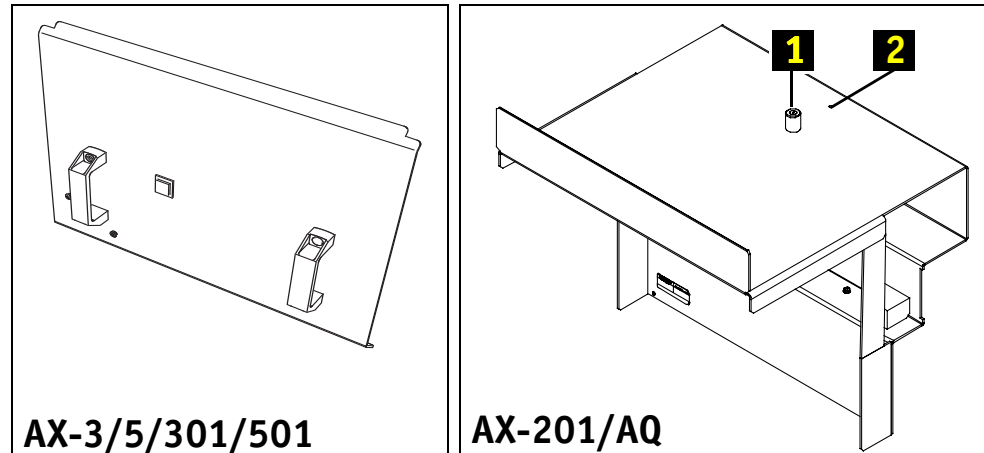


Figure 19 Trolley lift cover

The trolley lift cover is designed to enable safe operation of the machine when no trolley is available for a trolley slot. The switch on the trolley lift cover activates the trolley lift thereby closing the safety circuit (see chapter A5).

AX-201: Mount the marker on position 2.

AQ: Mount the marker on position 1.

E4.4 A-series feeder bank

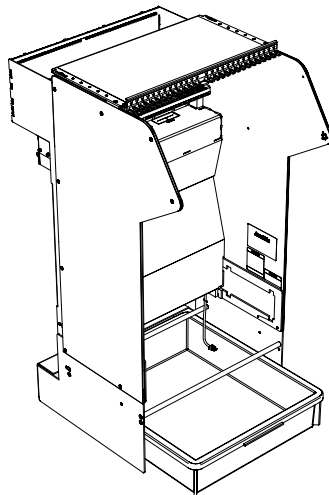


Figure 20 Feeder bank

The feeder bank has the same functions as the A-series feeder trolley, except it has no wheels and no handle, see [E4.1 A-series feeder trolley](#).

CHAPTER E5 Trouble shooting

E5.1 Troubleshooting workflow

The troubleshoot chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.



NOTE: Using the electronic version of the manual will enable the user to use hyperlinks and the 'back' button in the browser to navigate quickly through the information in separate paragraphs.

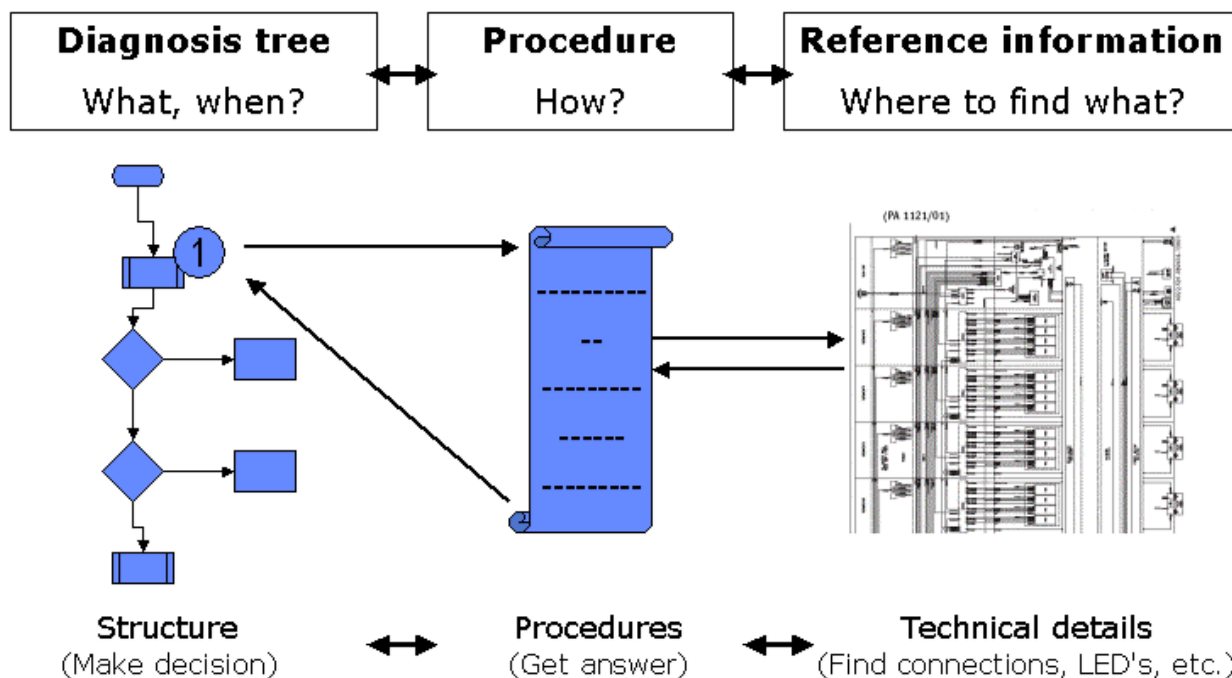


Figure 21 Visual structure of chapter 5

E5.2 Diagnosis trees and tables

E5.2.1 Diagnosis trees, conventions

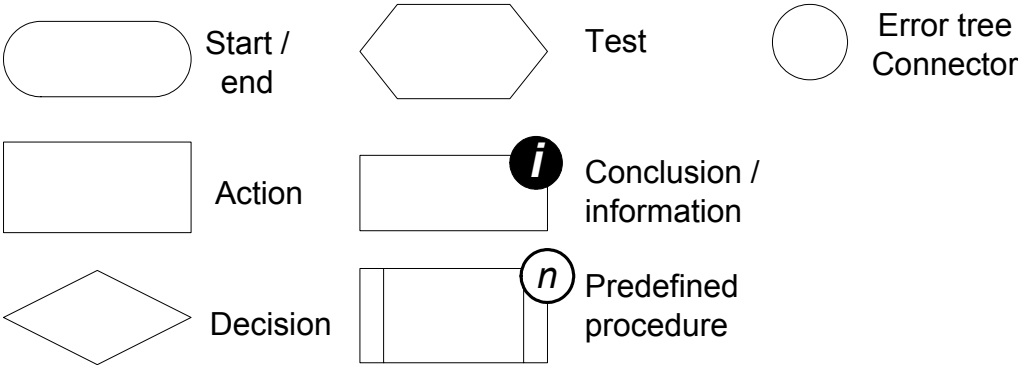
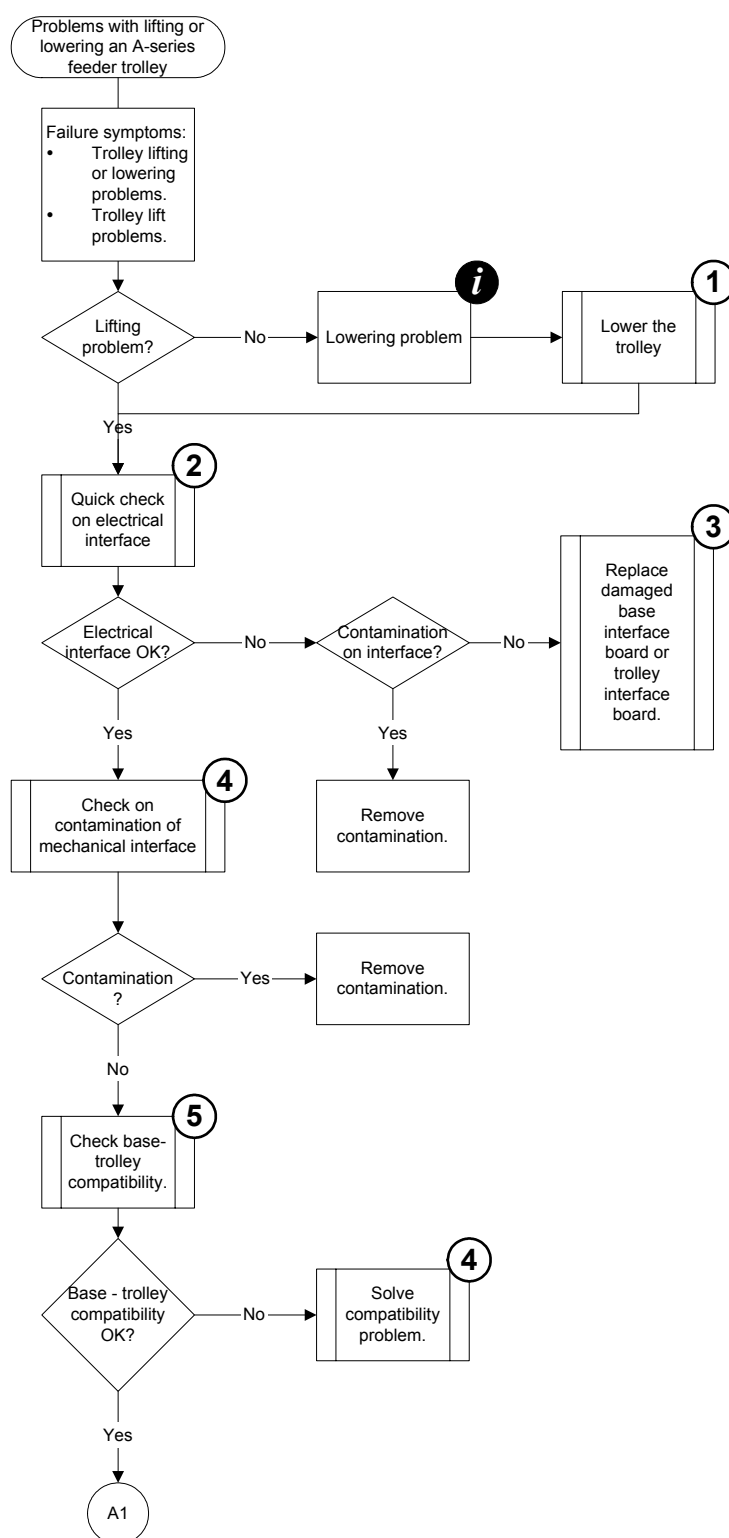


Figure 22 *Diagnosis trees, conventions*

E5.2.2 A-series feeder trolley, lifting and lowering diagnosis tree



Reference:

1. E5.2.2.1. Feeder trolley, lowering electrically,
E5.2.2.2. Feeder trolley, lowering mechanically
2. E5.2.2.3. Quick check on electrical interface
3. E8.3.5. Trolley interface electrical board, replacement or
AX301/501: B8.4.1.6 Flat cable on trolley lift, replacement
AX-201: B8.13.0.6 Flat cable on trolley lift, replacement
4. E5.2.2.4. Check on contamination of mechanical interface
5. E5.2.2.5. Check base-trolley compatibility

Figure 23

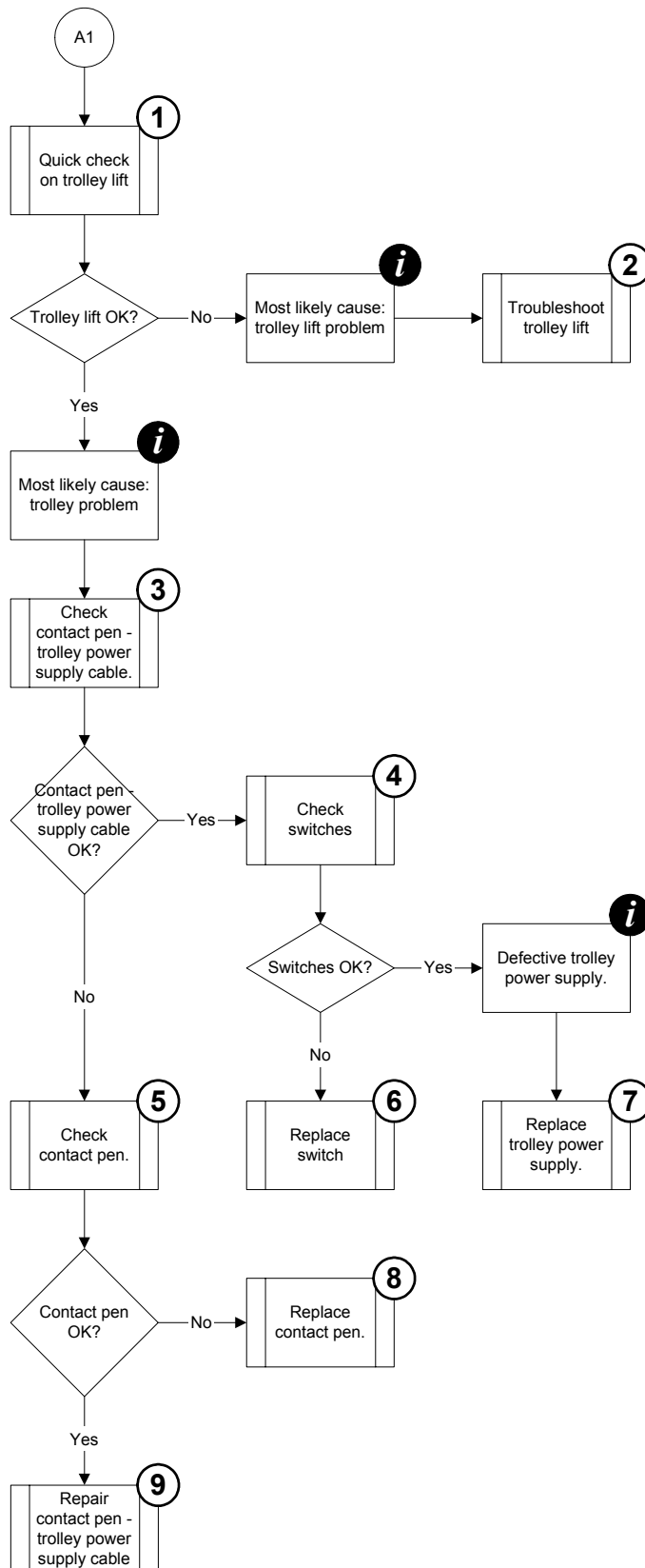


Figure 24

- 1.E5.2.2.6.Quick check on trolley lift.
- 2.AX-201: B5.2.3 Trolley lift, diagnosis tree
AX-301/501/3/5: B5.2.3 Trolley lift 4022-510-8300X, diagnosis tree
- 3.E5.2.2.7.Check contact pen - trolley power supply cable
- 4.E5.2.2.9.Check switches
- 5.E5.2.2.8.Check contact pen
- 6.E8.3.12.Trolley foot switch, replacement
- 7.E8.3.2.Trolley power supply board, replacement
- 8.E8.3.4.Contact pen, replacement
- 9.E5.4.1.A-series feeder trolley, diagram.

E5.2.2.1 Feeder trolley, lowering electrically

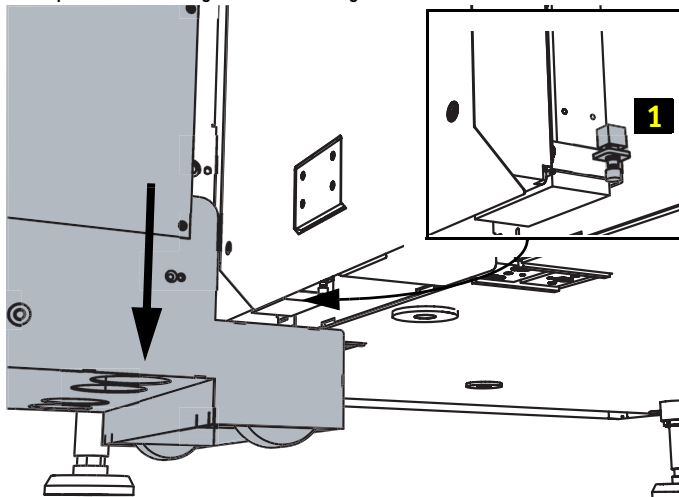
**DANGER OF CLAMPING FINGERS**

Serious injury to fingers.

Keep hands away from moving parts.



NOTE: Keep hands away from trolley while it comes down.



1. Remove the neighboring trolley on the right side.
2. Use the service switch (1) to lower the feeder trolley. Do not put any body parts under the feeder trolley.



NOTE: If this procedure does not lower the feeder trolley, continue to par [E5.2.2.2](#).

E5.2.2.2 Feeder trolley, lowering mechanically



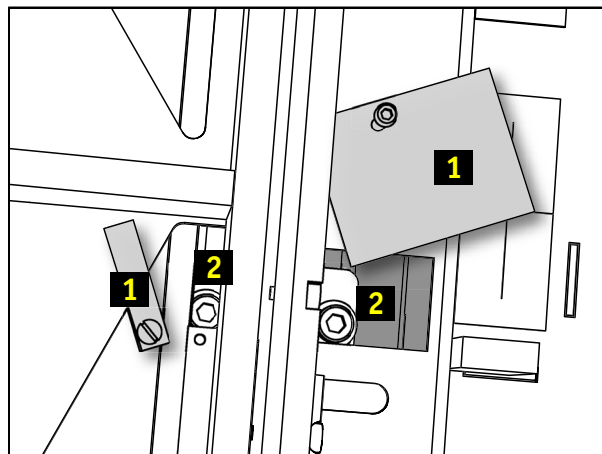
DANGER OF CLAMPING FINGERS
 Serious injury to fingers.
 Keep hands away from moving parts.

1. Prerequisites

- Remove all feeders from the trolley.
- Open all robots above the trolley.
- Remove the bottom feeder guide, see [E8.3.9](#).

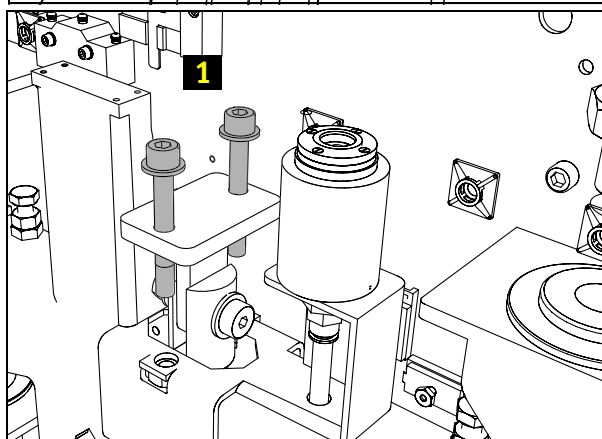
2. Lower the trolley

- Remove both cover plates (1) (2x 1 Allen bolt).
- Push an Allen key 6 mm x 350 mm through the 2 holes in the trolley lift cover plate.
- Loosen the 2 Allen bolts (2) that fix the trolley lift cross beam.
 The trolley lowers down due to its own weight.
 Do not put any body parts under the trolley.
- Remove the trolley from the trolley lift.



3. Mount the bolts on the cross beam

- Remove the trolley lift front plate (4 screws, 1 earth connection).
- Place the 2 Allen bolts (1) that fix the trolley lift cross beam back.
- Place the trolley lift front plate (4 screws, 1 earth connection) back.



E5.2.2.3 Quick check on electrical interface

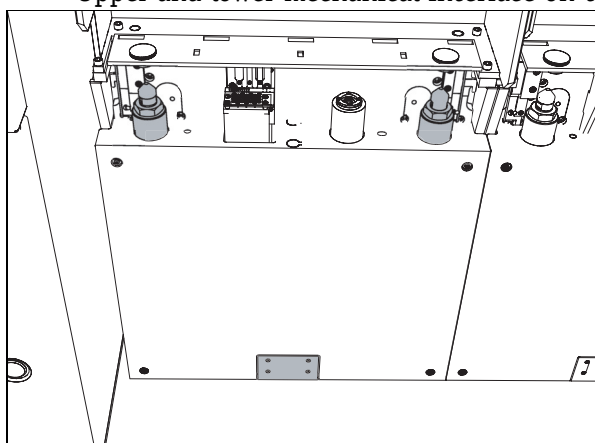
Inspect the electrical interface between the trolley and the trolley lift on damage or contamination (components causing short-circuit etc.):

- Trolley interface board, see [E5.3.1.3](#)
- Base interface board on trolley lift.

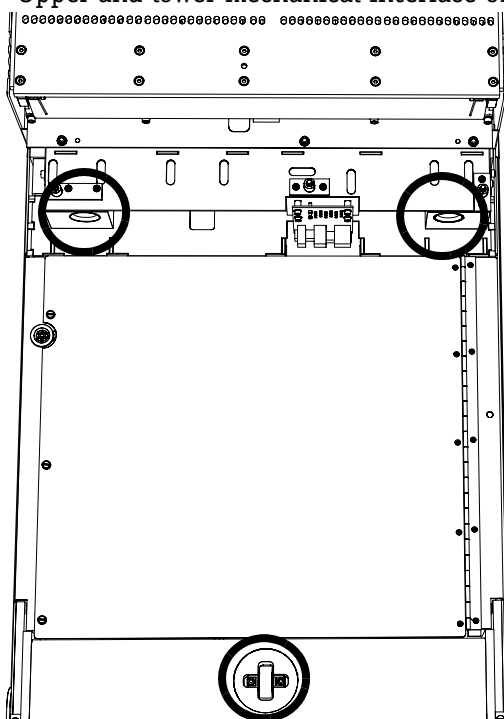
E5.2.2.4 Check on contamination of mechanical interface

Inspect the mechanical interface between the trolley and the trolley lift on contamination (components causing trolley misalignment etc.):

- Upper and lower mechanical interface on the trolley lift.

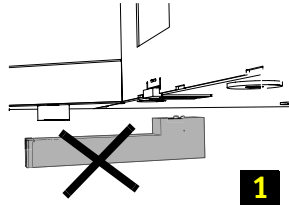


- Upper and lower mechanical interface on the trolley.



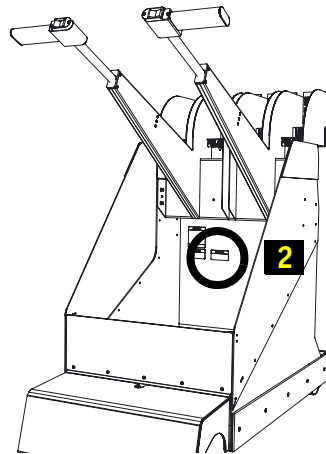
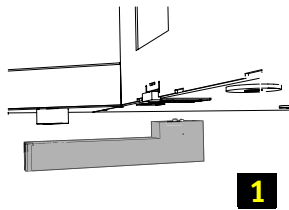
E5.2.2.5 Check base-trolley compatibility

- In case of A-series feeder trolleys:



- Trolley stop (1) absent.

- In case of upgraded FCM-II feeder trolleys:



- Trolley stop (1) present.
- FCM-II feeder trolleys are upgraded with AX FCM II trolley upgrade (PA 2631/50) (2).
- Trolley Y- and Z-position correctly adjusted, see [E6.5](#)

E5.2.2.6 Quick check on trolley lift

Interconnect the 'common' and 'up' connections on the trolley lift. See chapter B5.
If the trolley lift moves upward, the trolley lift is OK.

E5.2.2.7 Check contact pen - trolley power supply cable

1. Open the door to the trolley power supply.
2. Disconnect the X9 and X12 from the trolley power supply, see [E5.3.1.2](#).
Find the location of the 'up', 'down' and 'common' contact pen, see [E5.3.1](#).
 - a) Measure the resistance of the cable from X9 (both pins) to the 'common' contact pen.
Two measurements (both pins on X9) of 0 Ohm is OK.
 - b) Measure the resistance of the cable from X12 pen 1 to the 'down' contact pen.
0 Ohm is OK.
 - c) Measure the resistance of the cable from X12 pen 2 to the 'up' contact pen.
0 Ohm is OK.

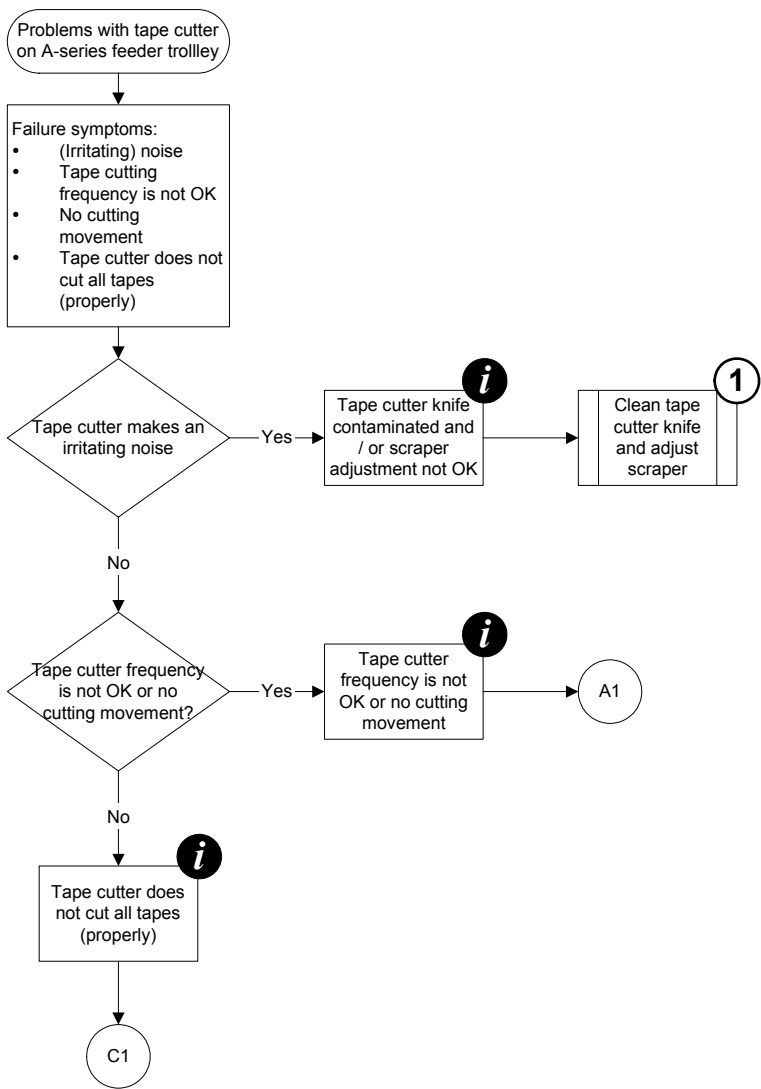
E5.2.2.8 Check contact pen

1. Remove the contact pin (using pliers) from the contact pen housing.
Check that there is no corrosion on the contact pen or inside the contact pen housing.
2. Open the door to the trolley power supply.
3. Disconnect the X9 and X12 from the trolley power supply, see [E5.3.1.2](#).
Find the location of the 'up', 'down' and 'common' contact pen housing, see [E5.3.1](#).
 - a) Measure the resistance of the cable from X9 (both pins) to the 'common' contact pen housing.
Two measurements (both pins on X9) of 0 Ohm is OK.
 - b) Measure the resistance of the cable from X12 pin 1 to the 'down' contact pen housing.
0 Ohm is OK.
 - c) Measure the resistance of the cable from X12 pin 2 to the 'up' contact pen housing.
0 Ohm is OK.

E5.2.2.9 Check switches

1. Open the door to the trolley power supply.
2. Disconnect X8 and X11 from the trolley power supply, see [E5.3.1.2](#)
3. Measure the resistance:
 - d) While the 'up' foot switch is pressed, measure the resistance of the cable from X8 pin 3 to pin 4.
0 Ohm is OK.
 - e) While the 'down' foot switch is pressed, measure the resistance of the cable from X11 pin 1 to pin 2.
0 Ohm is OK.

E5.2.3 A-series feeder trolley, tape cutter diagnosis tree

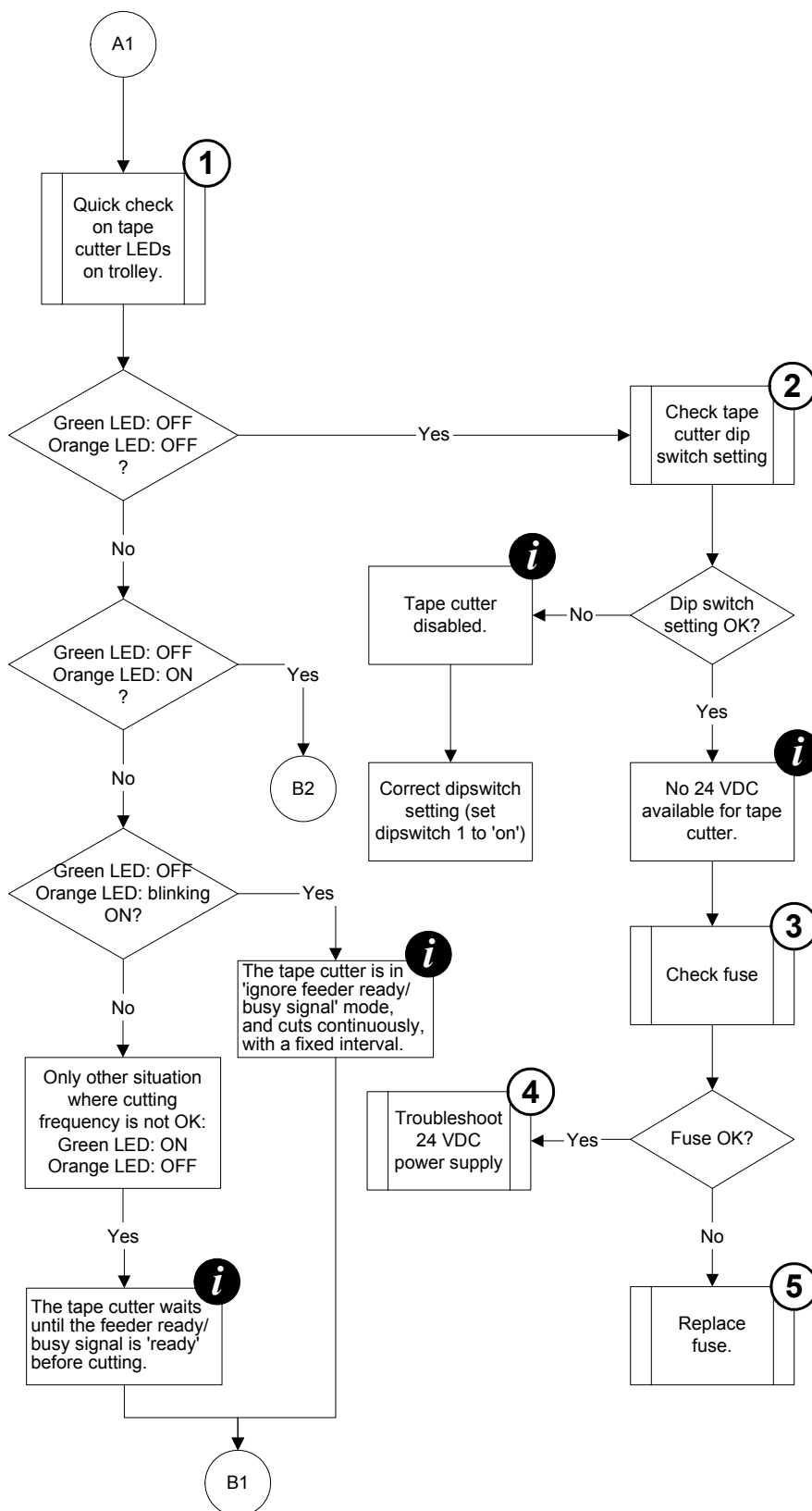


Reference:

1.E7.1 Tape cutter knife, cleaning and scraper adjustment .

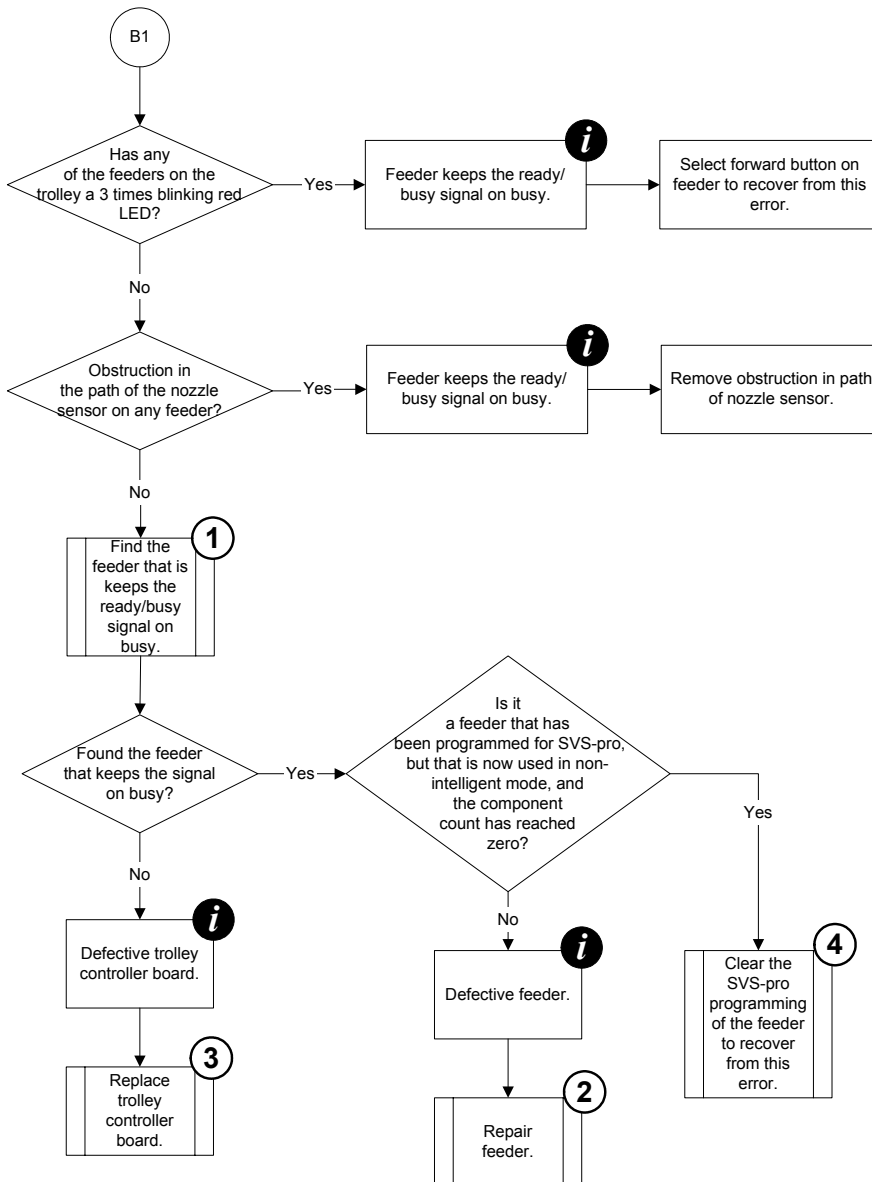
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Figure 25 Tape cutter diagnosis tree, 1

**Reference:**

- 1.E5.3.1.1 A-series feeder trolley and tape cutter, LED signalling .
- 2.E5.3.2.1.Tape cutter controller, connections and settings
- 3.E5.2.3.2.Check fuse
- 4.E5.4.1.A-series feeder trolley, diagram
- 5.Chapter B8 Glass fuse 5mmx20mm slow blow 4A on trolley lift, replacement.

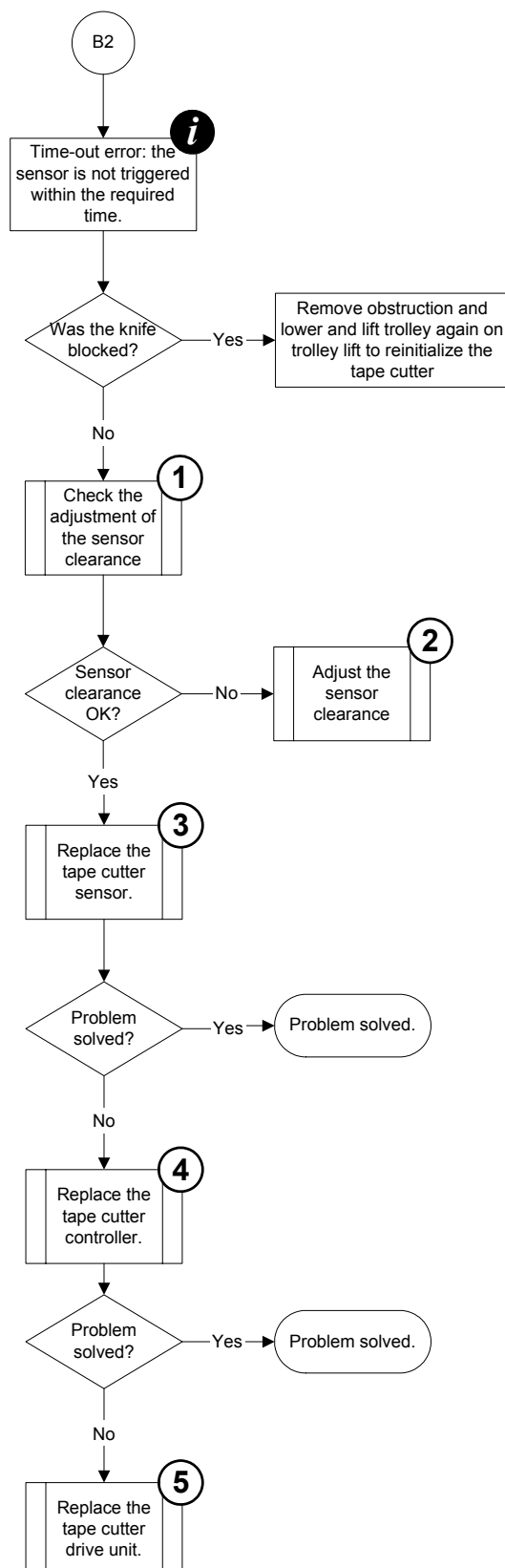
Figure 26 Tape cutter diagnosis tree, 2



Reference:

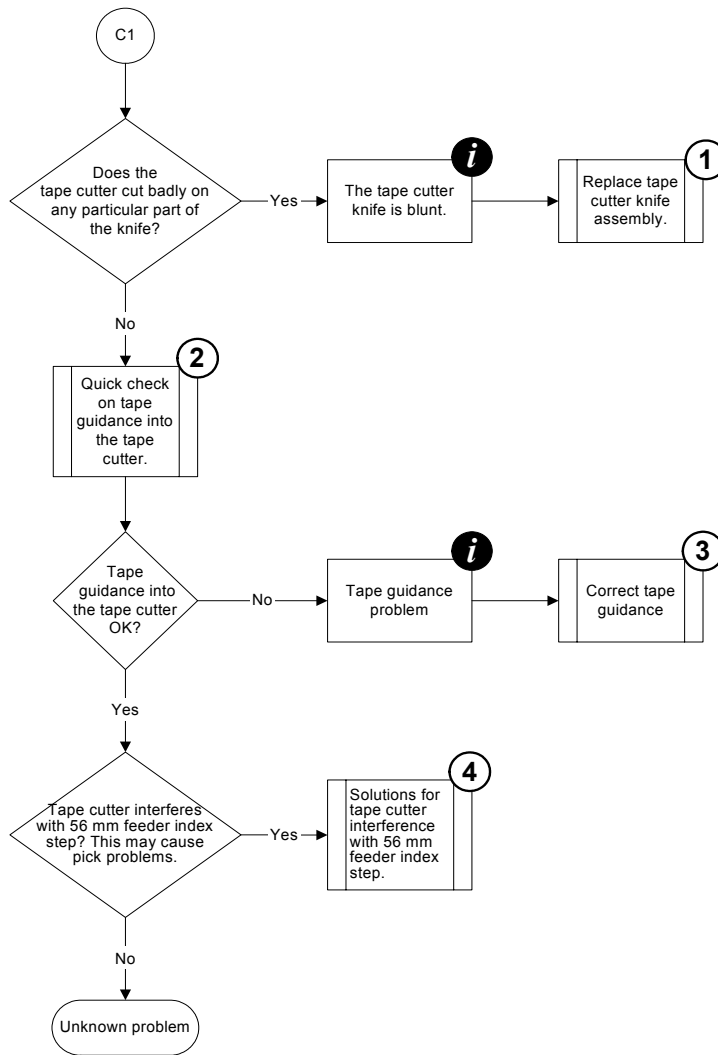
1. E5.2.3.3 Find the feeder that is keeps the ready/ busy signal on busy.
2. See Feeder Service Manual.
3. E8.3.1.Trolley controller board, replacement
4. See SVS Pro manual.

Figure 27 Tape cutter diagnosis tree, 3

**Reference:**

- 1.E6.4 Tape cutter sensor, adjust clearance
- 2.E6.4 Tape cutter sensor, adjust clearance
- 3.E8.4.3 Tape cutter sensor, replacement or
E8.5.4 Tape cutter sensor, replacement
- 4.E8.4.4 Tape cutter controller, replacement or
E8.5.5 Tape cutter controller, replacement
- 5.E8.4.5 Tape cutter drive unit, replacement or
E8.5.3 Tape cutter drive unit, replacement

Figure 28 Tape cutter diagnosis tree, 4



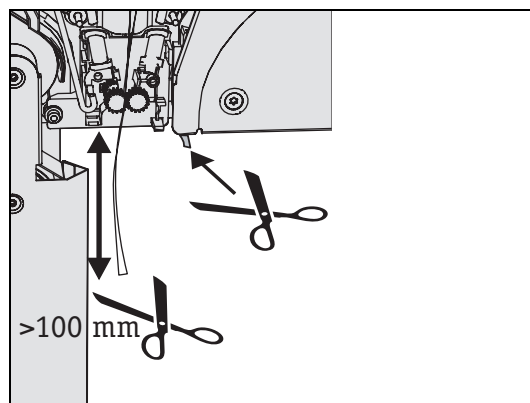
Reference:

- 1.E8.4.2 Knife assembly, replacement or E8.5.2 Knife assembly, replacement
- 2.E5.2.3.1 Quick check on tape guidance into the tape cutter
- 3.See Operating Manual or Feeder Service Manual
- 4.E5.2.3.4 Solutions for tape cutter interference with 56 mm feeder index step

Figure 29 Tape cutter diagnosis tree, 5

E5.2.3.1 Quick check on tape guidance into the tape cutter

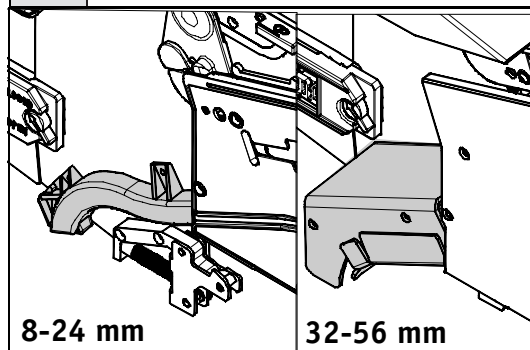
1. Check that all tape is cut off directly below the feeder (see operating manual), when a feeder is placed into the trolley. (Then the tape will be guided into the tape cutter).



2. Check that all feeders are equipped with the required tape guide:

- 8-24 mm curved, black plastic tape guide.
- 32-56 mm metal tape guide.

These tape guides are necessary to guide the tape into the tape cutter. For more information see the feeder service manual.



E5.2.3.2 Check fuse

1. Remove the trolley lift cover plate.
2. Check that fuse F1 is OK. For more information see chapter B5 Reference information.

E5.2.3.3 Find the feeder that is keeps the ready/busy signal on busy.

Remove the feeders from the trolley one by one. The tape cutter starts cutting again, after the feeder that keeps the ready/busy signal on busy, is removed.

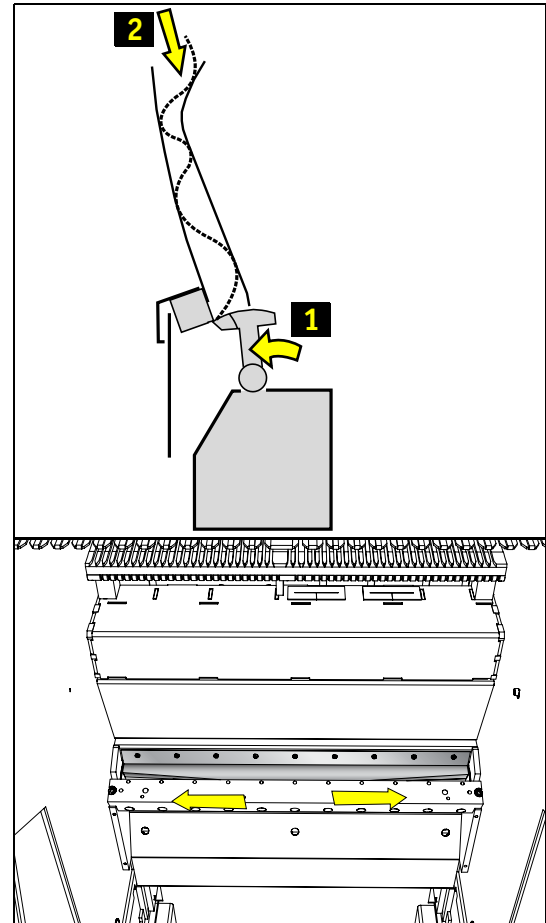
E5.2.3.4 Solutions for tape cutter interference with 56 mm feeder index step

There is a possibility that the tape cutter knife blocks (1) the tape during a 56 mm index (2). This may cause pick problems.

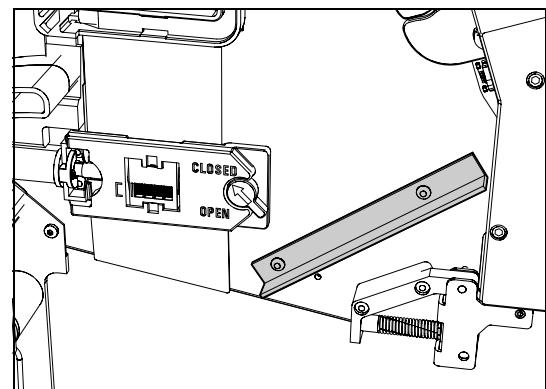
Carrier tape with the length of the feeder index step has to be buffered in the tape cutter run-in. Given the stiffness of some blister tapes, it is possible that the carrier tapes derails inside the feeder, because there is not enough room in the tape cutter run-in. This causes pick problems on the feeder.

Possible solutions:

1. Place the feeder with the pick problems on the outside of the trolley (the tape cutter knife is closed for a shorter time on the outsides of the trolley, because of to V-shape of the knife).



2. Change the cutting interval of the tape cutter using the potentiometer on the tape cutter controller, see [E5.3.2.1 Tape cutter controller, connections and settings](#).
3. It may be preferred to mount the tape guide made out of metal angled profile, so it is possible to route the carrier tape on the outside of the tape cutter. Then the carrier tape will not be cut by the tape cutter, but has to be cut manually.



E5.3 Reference information

E5.3.1 A-series feeder trolley, features

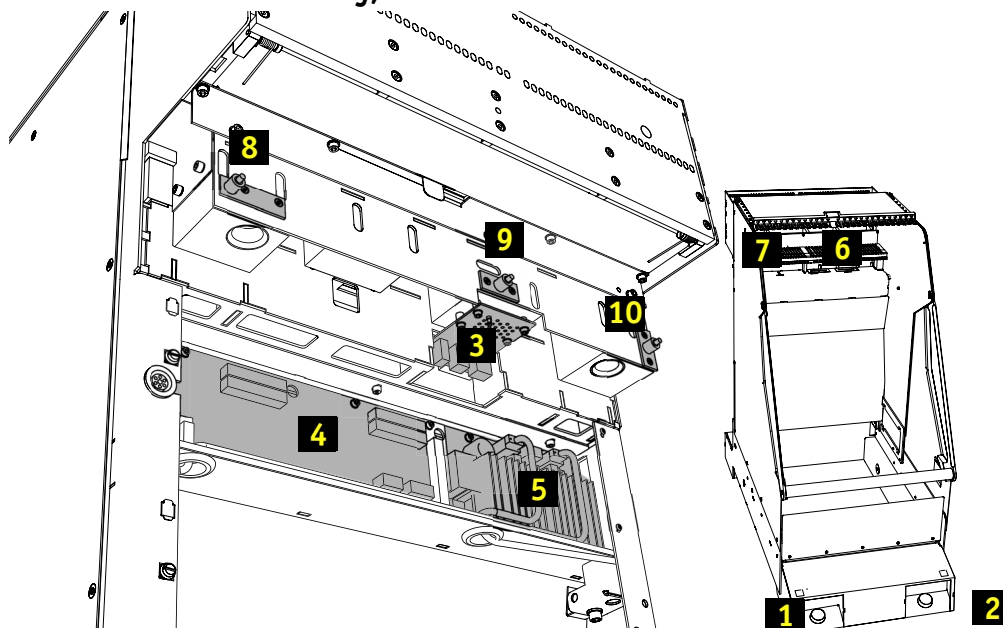


Figure 30 A-series feeder trolley, features

Item	Description	Reference
Trolley		
1	Foot switch, down	
2	Foot switch, up	
3	Trolley interface board	E5.3.1.3
4	Trolley controller board	See the SVS-Pro option manual
5	Trolley power supply board	E5.3.1.2
6	Feeder interface electrical board	-
7	Trolley, LED signalling	E5.3.1.1
8	Trolley lift connection 'common'.	
9	Trolley lift connection 'up'.	
10	Trolley lift connection 'down'.	

Figure 31 A-series feeder trolley, features

E5.3.1.1 A-series feeder trolley and tape cutter, LED signalling

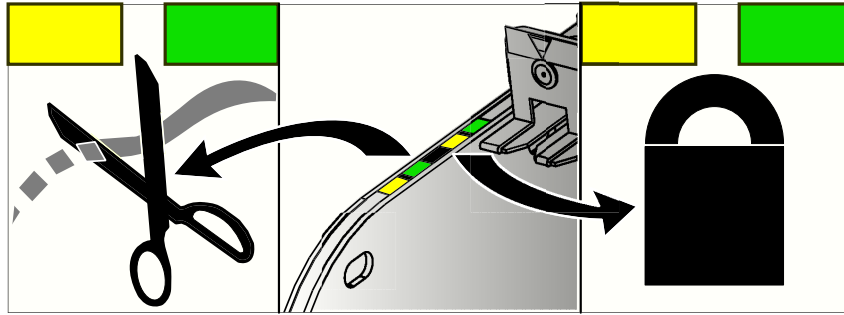


Figure 32 Trolley LED signalling

Trolley LED		Meaning
Green	Orange	
Off	Off	Trolley is not (electrically) connected to the trolley lift.
On	Off	Trolley is fully lifted and locked (the safety interlock on the trolley lift is closed).
Off	On	Trolley lift is busy lifting.
On	On	Not applicable.

Figure 33 Trolley LED signalling

Tape cutter LED		Meaning
Green	Orange	
Off	Off	<ol style="list-style-type: none"> 1. Tape cutter is disabled (see the dips witch settings on the tape cutter controller board in E5.3.2.1 Tape cutter controller, connections and settings) 2. No 24 VDC available for the tape cutter. This can be caused by fuse F1 in the trolley lift or by a defective tape cutter controller. 3. The tape cutter is busy cutting (takes less than 2 seconds). 4. Tape cutter is busy with initializing (directly after trolley is lifted on machine) (takes less than 5 seconds).
Off	On	<p>Time-out error: the sensor is not triggered within the required time.</p> <p>This can be caused by something that has blocked the rotating knife. When the rotating knife is blocked, the knife will open, and try again. If the knife is then still blocked, it will open and stay open. Remove the obstruction and lower and lift the trolley on the trolley lift to re initialize the tape cutter.</p> <p>The time-out error can also be caused by a wrong sensor clearance adjustment, see E6.4 Tape cutter sensor, adjust clearance .</p>
On	Off	<p>Tape cutter is ready to function.</p> <p>The tape cutter waits until the feeder ready/busy signal is 'ready' before cutting, if the dip switch is in the default setting, see E5.3.2.1 Tape cutter controller, connections and settings</p>

Tape cutter LED		Meaning
On	On (blinking)	<p>The tape cutter is in 'ignore feeder ready/busy signal' mode (available in tape cutter software 1.6 and newer).</p> <p>When the tape cutter is set to cut when triggered by the ready/busy signal of the feeders (see the dipswitch settings on the tapecutter controller board in E5.3.2.1 Tape cutter controller, connections and settings), and the tape cutter controller detects that the feeders have been busy for more than 10 seconds, the tape cutter goes into 'ignore feeder ready/busy signal' mode, and cuts continuously, according to the timing interval set by the potentiometer.</p> <p>This can be caused by :</p> <ul style="list-style-type: none"> - top foil of a feeder that is blocking the nozzle sensor. Remove the obstruction from the path of the nozzle sensor (top foil etc.) to recover from this error. - A feeder that has been programmed for SVS-pro, but that is now used in non intelligent mode, and the component count has reached zero. Clear the SVS - pro programming of the feeder to recover from this error. - A feeder that is powered up while the nozzle sensor was blocked. <p>The red LED of the feeder is blinking 3 times.</p> <p>Select the forward button on feeder to recover from this error.</p> <ul style="list-style-type: none"> - Defective feeder controller board.
On	On (Permanently)	Not applicable.

Figure 34 Tape cutter LED signalling (tape cutter optional)

E5.3.1.2 Trolley power supply board

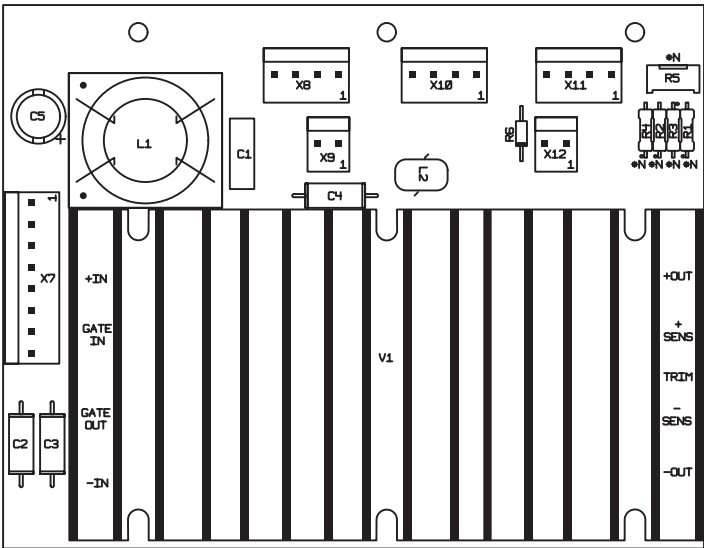


Figure 35 Trolley power supply board

E5.3.1.3 Trolley interface board

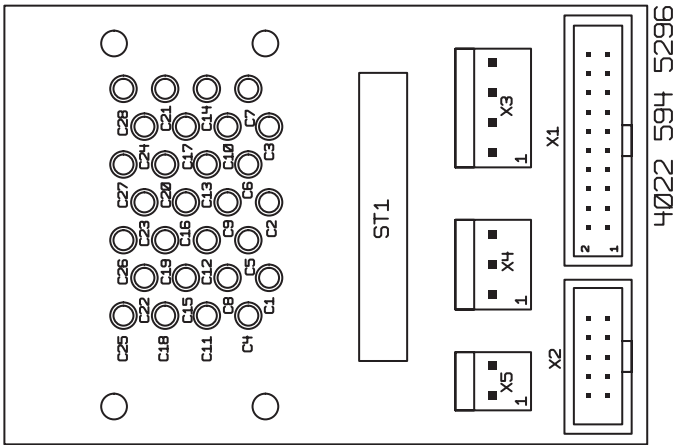


Figure 36 Trolley interface board

E5.3.2 Tape cutter, features

Item	Description
1	Tape cutter controller
2	Knife assembly
3	Sensor
4	Drive unit

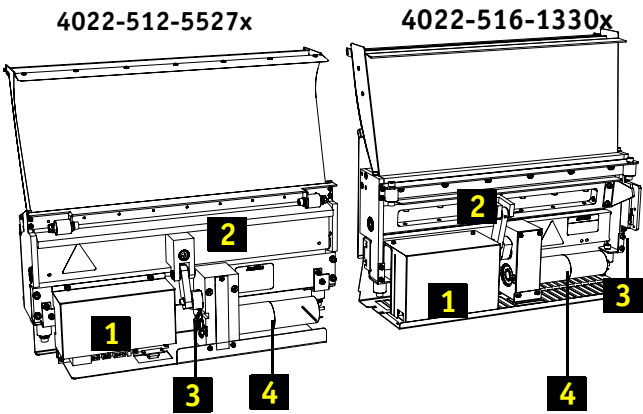


Figure 37 Tape cutter

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E5.3.2.1 Tape cutter controller, connections and settings

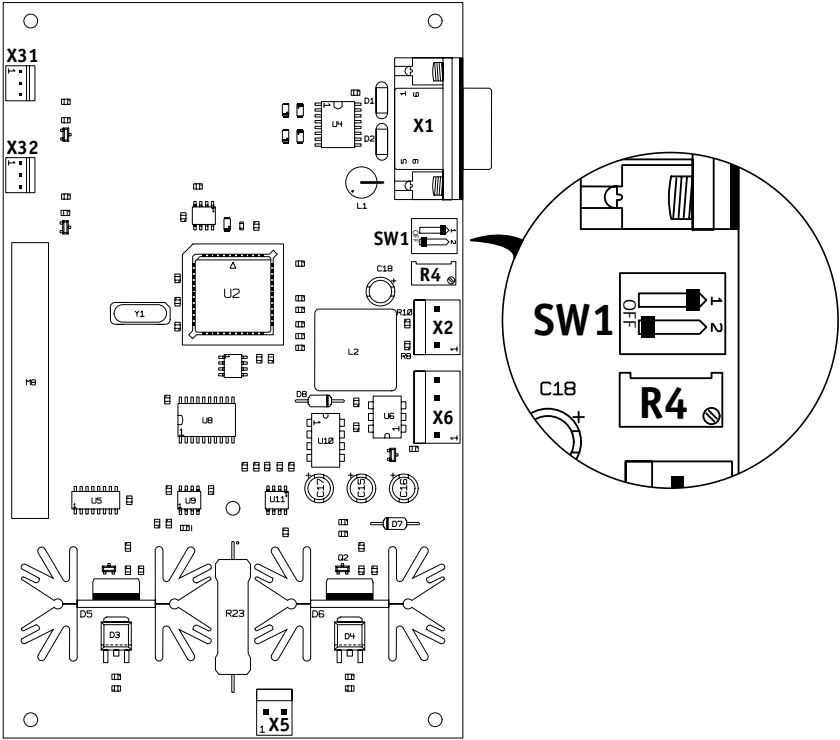


Figure 38 Tape cutter controller, connections

Label	Description	Reference
X1	Not used	
X2	Status LEDs	
X5	Motor	
X6	24V DC power supply	
X31	Not used	
X32	Sensor	
SW1	Dip switch	See Figure 40 Tape cutter controller, settings
R4	Potential meter	See Figure 40 Tape cutter controller, settings
U2	CPU	Labelled with SW version

Figure 39 Tape cutter controller, connections

	Dip switch SW1	Off	On
Tape cutter enabled	1	Tape cutter is disabled.	Tape cutter is enabled (default setting).
Tape cutting mode	2	The tape cutter is triggered by the ready/busy signal of the feeder and cuts with the timing. (Default setting)	The tape cutter cuts continuously with the timing interval set by the potentiometer.

	Potentiometer	Setting
Timing interval	R4	10 seconds (can be adjusted for specific applications).

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Figure 40 Tape cutter controller, settings

E5.3.3 Upgraded FCM feeder trolley, features

No specific features apply.

E5.4 Diagrams

Trolleys exist in different technical versions:

- A-series feeder trolley, see [E5.4.1](#).
- FCM feeder trolley for AX / Upgraded FCM-II feeder trolley, see [E5.4.2](#).

E5.4.1 A-series feeder trolley, diagram

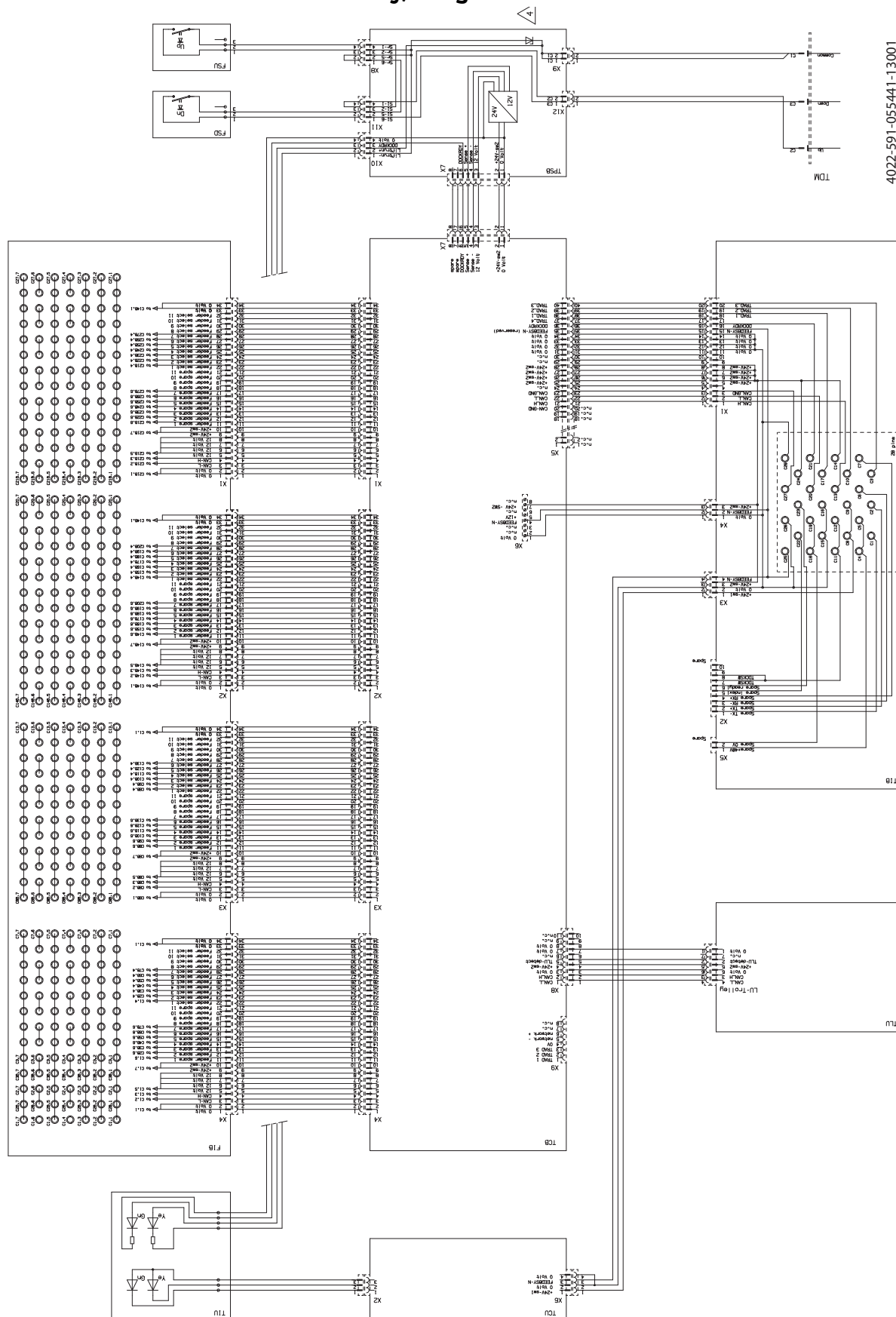
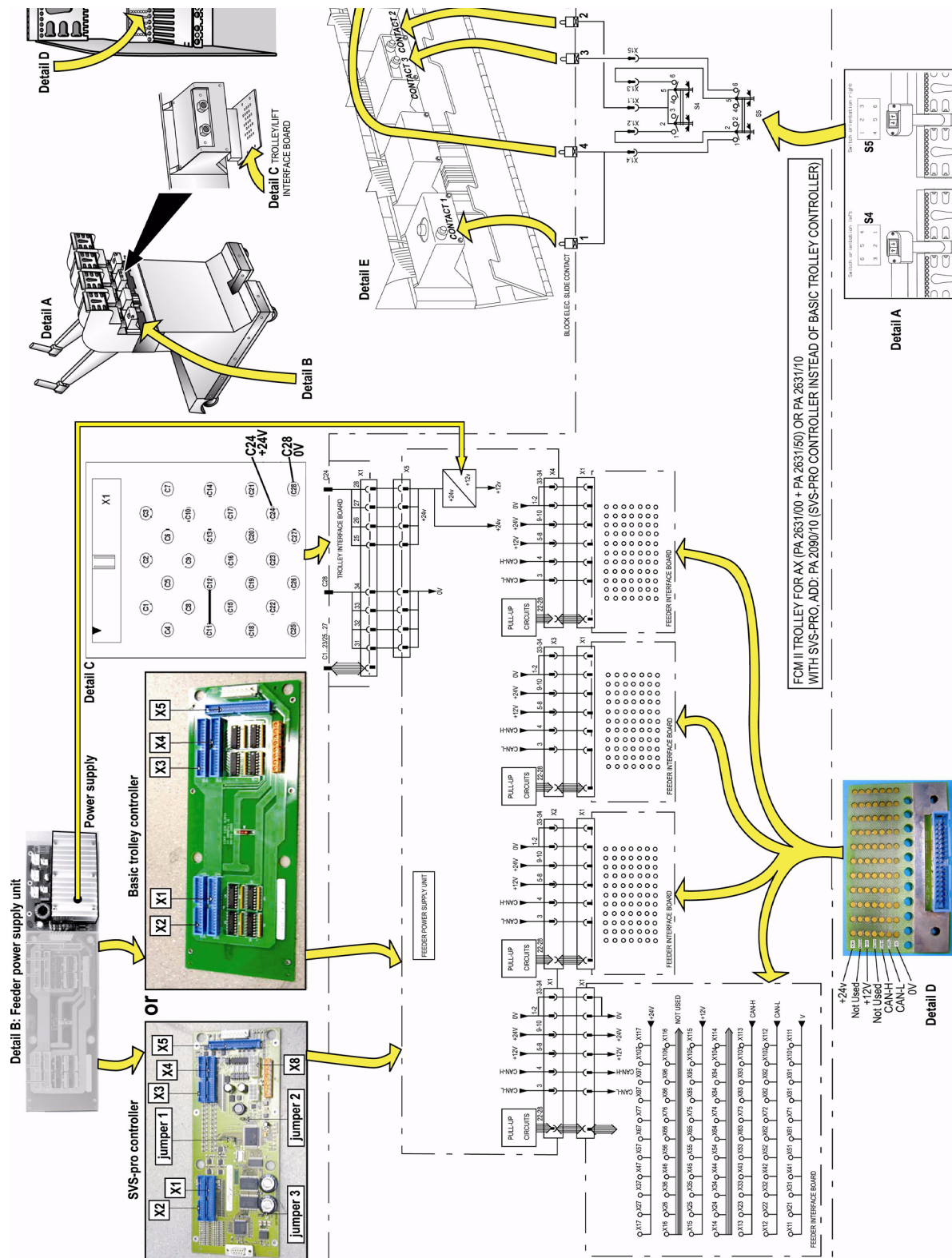


Figure 41 A-series feeder trolley, diagram

E5.4.2 FCM feeder trolley for AX/ upgraded FCM feeder trolley, diagram



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Figure 42 FCM trolley for AX / Upgraded FCM feeder trolley, diagram

CHAPTER E6 Measurement, adjustment and calibration

E6.1 A-series feeder trolley, height adjustment



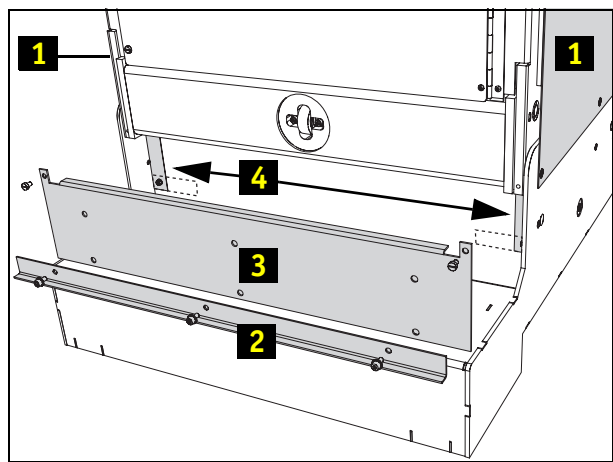
NOTE: This procedure applies when changing the board transport height from SMEMA range to JIS range, or vice versa.

CAUTION

HEAVY OBJECT (± 103 kg)
Improper lifting method may cause injury.
Use 3 persons to lift the object.

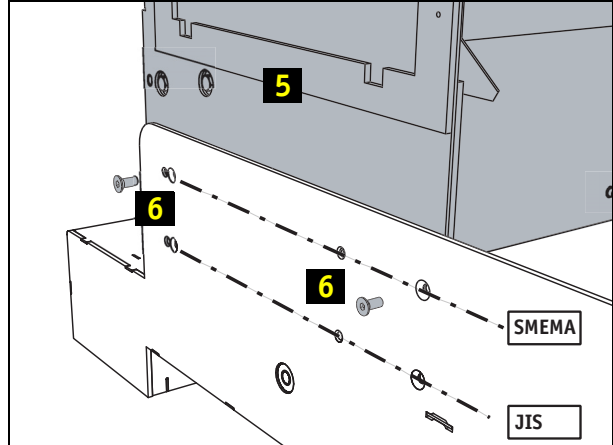
1. Prerequisites

- Remove both side plates (1) (2x12 cross head screws).
- Remove the cover strip (2) (3 Allen bolts).
- Remove the cover plate (3) (2 Allen bolts).
- Remove the two small cover plates (4) (2x1 Allen bolt).



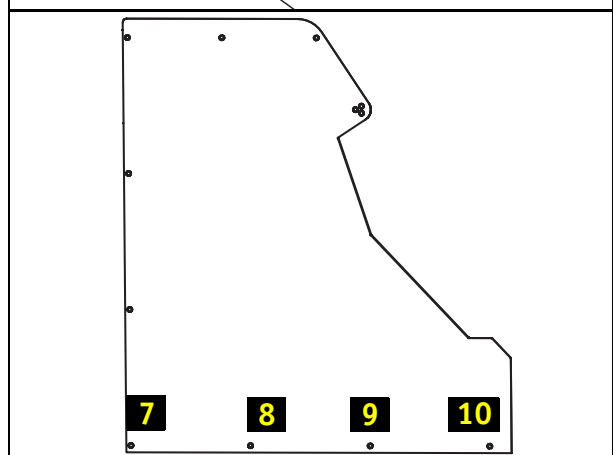
2. Put the trolley to the correct height

- Lift the trolley frame (5), using 3 persons.
- Unscrew the trolley frame from the trolley wheel base (6) (2 Allen screws at each side).
- Lower or lift the trolley frame to the correct height.
- Fasten the trolley frame to the trolley wheel base (6) (2 Allen screws at each side).



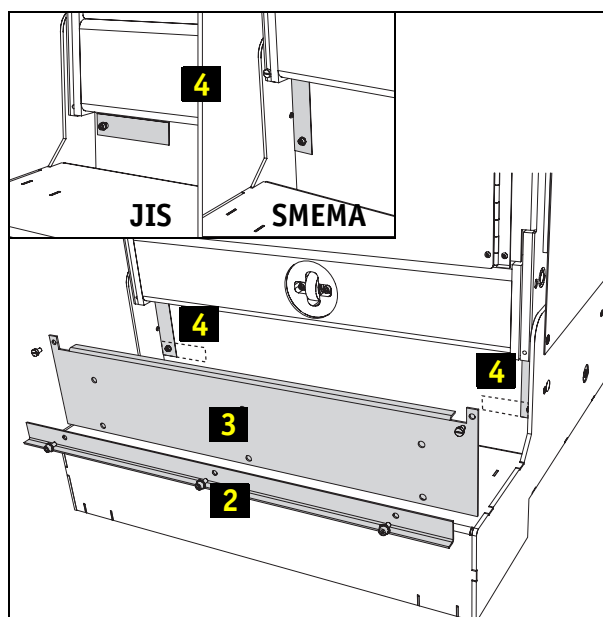
3. Mount both side plates

- Place both side plates (2x12 cross head screws)
The screws have 3 different lengths (see picture):
Large: location 7 and 8.
Medium: location 9 and 10.
Small: all other locations.



4. Finalize

- Place the two small cover plates (4) (2x1 Allen bolt) back according picture.
- Place the cover plate (3) back (2 Allen bolts).
- Place the cover strip (2) back (3 Allen bolts).



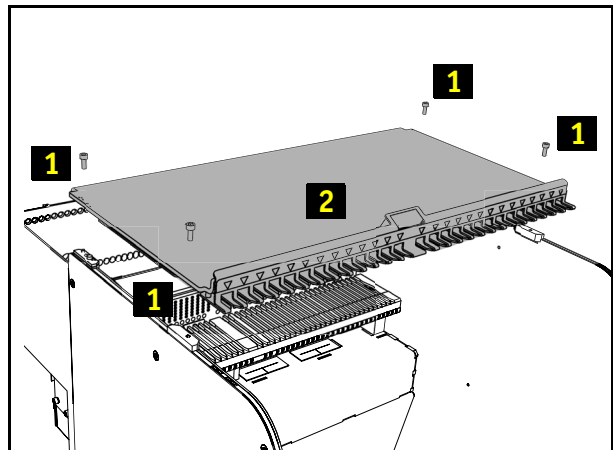
E6.2 A-series trolley including air upgrade, make trolley fit for use for twin bulk feeders (TBF)

This procedure is applicable for A-series feeder trolleys on which the 'upgrade air' (PA 2632/10) has been installed and that previously has been used on the AX-201 / AQ machine (so the upper feeder guide is mounted and the trolley wings are 'parked' inside the trolley).

When this trolley is to be used together with twin bulk feeders follow this procedure.

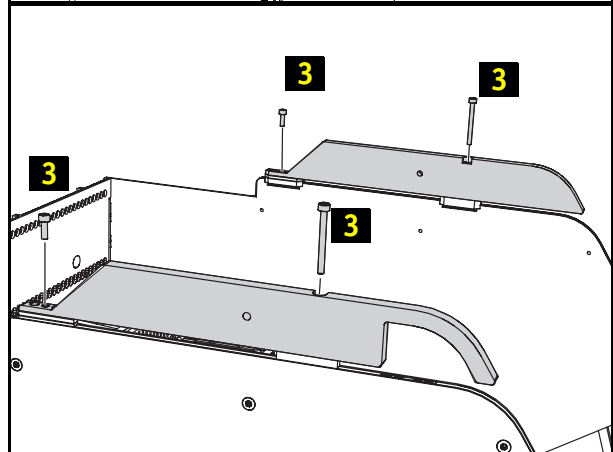
1. Remove the upper feeder guide

- Remove the 4 Allen bolts (1).
- Remove the upper feeder guide (2) from its dowels.



2. Mount the trolley wings

- Take the trolley wings out of their 'parking space' inside the trolley.
- Mount the trolley wings (2 Allen bolts (3)).



E6.3 A-series trolley including air upgrade, make trolley fit for use on AX-201 / AQ

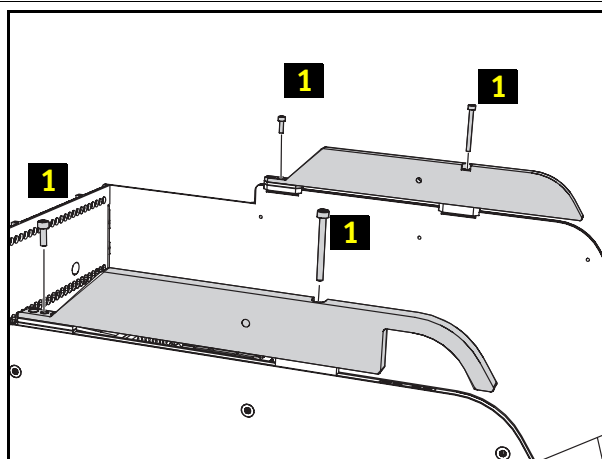
This procedure is applicable for A-series feeder trolleys on which the 'upgrade air' (PA 2632/10) has been installed (so this trolley can be used together with twin bulk feeders (TBF) on the AX machine only).

This 'upgraded trolley' cannot be used on an AX-201 / AQ machine.

When this 'upgraded trolley' is to be used on an AX-201 / AQ machine, this procedure has to be executed to ensure a safe working situation. (Without the upper feeder guide the moving parts of the AX-201 / AQ machine are not properly shielded.)

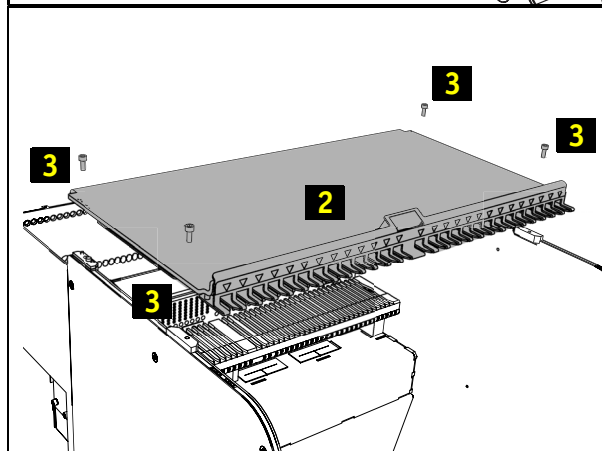
1. Remove the trolley wings

- Remove the wings (2 Allen bolts (1)).
- 'Park' the trolley wings: mount the trolley wings inside the trolley (to prevent loss).



2. Mount the upper feeder guide

- Mount the upper feeder guide (2) on its dowels.
- Fasten the 4 Allen bolts (3).



E6.4 Tape cutter sensor, adjust clearance



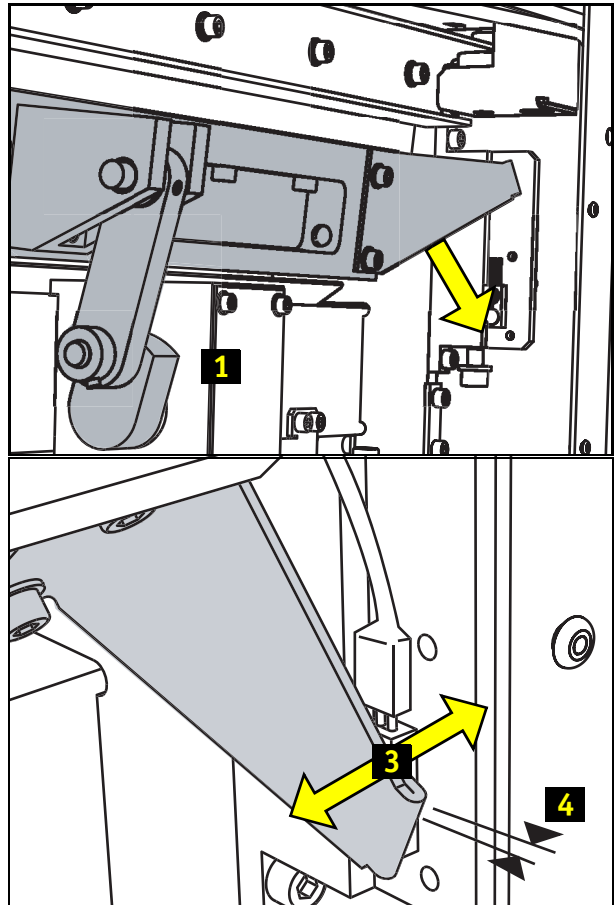
NOTE: This procedure is only applicable for tape cutters 4022-512-5527X (on these tape cutters the sensor is mounted on a bracket on the side instead of on the gearbox).
For tape cutter identification see [E3.3 A-series feeder trolley, tape cutter identification](#) . Adjust the sensor clearance after a sensor replacement.

1. Prerequisites

- Open the lid to the tape cutter.
- Rotate the knife (1) if necessary, using an adjustable open end wrench.

2. Adjust the sensor trigger bracket

- Bend the sensor trigger bracket (3) to adjust the sensor clearance (4) to 0.5 mm.



E6.5 FCM trolley for AX, height adjustment

If a trolley is used on several machines in a factory they might have to be readjusted if the difference in height between the highest and the lowest machine exceeds 13 mm.

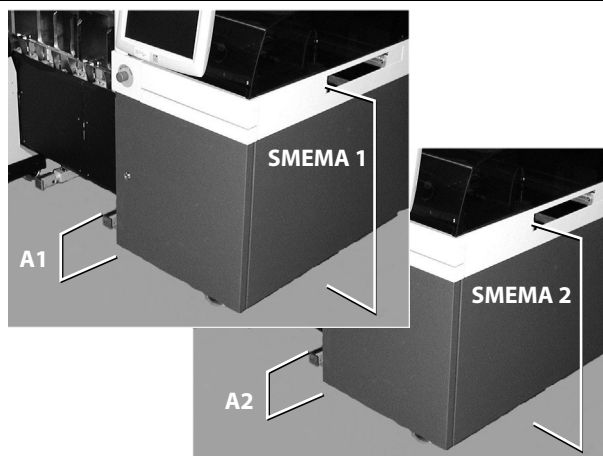
If a machine is adjusted on the lower end of the SMEMA range then the feeder trolley interface can collide with the base of the machine. If a machine is adjusted at the upper end of the SMEMA range then the inlet of the trolley can collide with the base arm of the machine.

Exchangeability of feeder trolleys between several machines is best when:

- The floor is according specification, see Pre Installation Manual
- The FCM feeder trolley is correct adjusted, see procedure below:

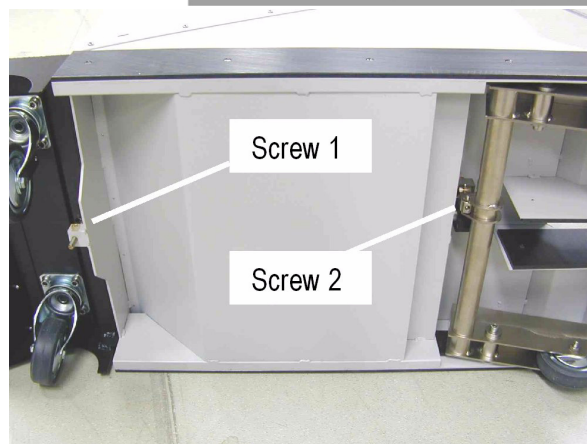
1. Trolley height definition

- Define the highest height (A1,A2....) between the floor and the top of the base arms of all machines in the factory.



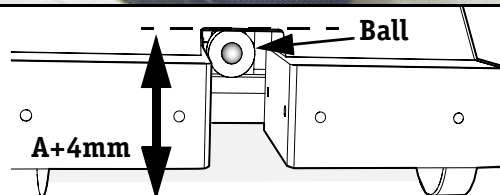
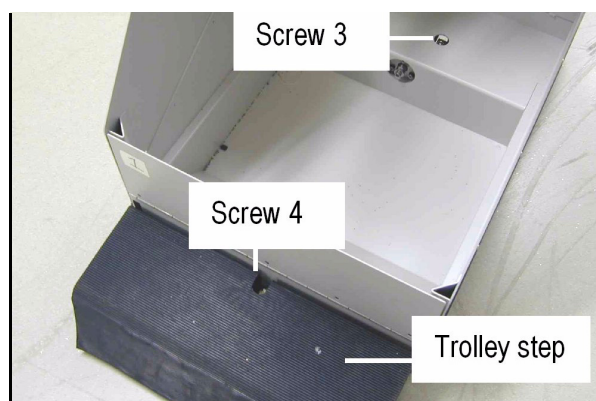
2. Release trolley adjustment screws

- Turn the trolley over and loosen screws 1 and 2 a bit, which lock screws 3 and 4 (see step 3).
- Place the trolley upright.



3. Adjust trolley height

- Adjust the height of the trolley to the highest "A" (see step 1) by turning screw 3 with the trolley removed from the machine. Add 4 mm.
 - * Raise trolley: turn screw 3 clockwise.
 - * Lower trolley: turn screw 3 counter clockwise.



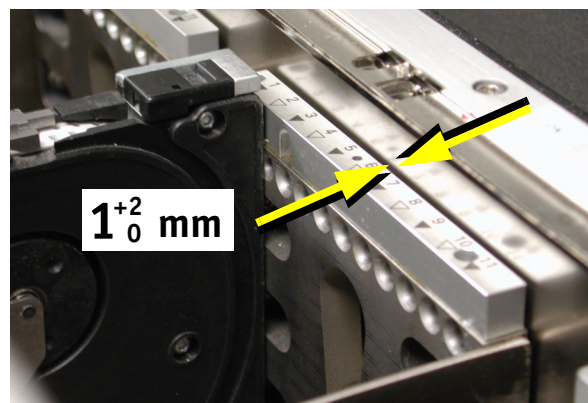
4. Level trolley at the machine

- Move the trolley towards the machine so that the ball (see step 3) of the trolley inlet touches the base arm.

Note: Do NOT lift the trolley.

- Level the trolley by adjusting screw 4 (see step 3). The trolley is levelled when the distance between trolley interface plate and front-rail is 1^{+2}_0 mm.

Note: The trolley height does NOT affect the pick position. The pick position is fixed when the trolley is lifted.



5. Finalize

- Turn the trolley over again and re-tighten screws 1 and 2 (see step 2).
- Place and lift the trolley and check:
 - * if the wheels closest to the machine are free from the ground.
 - * if the trolley step (see step 3) can be lifted when the trolley is in the upper position.
- If not, readjust the machine and trolley according to the procedures.

E6.6 FCM trolley upgrade procedure, for use on AX-301/501

To adapt the FCM feeder trolley for use with an AX-301/501, use the procedure described in the Option Manual AX FCM trolley upgrade (PA 2631/50).

CHAPTER E7 Maintenance instructions

This chapter contains detailed (corrective and preventive) maintenance instructions. The preventive maintenance intervals are defined in chapter A7.

For the trolley, no specific procedures for maintenance apply.

E7.1 Tape cutter knife, cleaning and scraper adjustment



IRRITATING SUBSTANCE

Direct contact may cause irritation of the skin.
Avoid direct contact. Use Personal Protection Equipment.



CUTTING HAZARD

Serious injury to body parts.
Use gloves when handling.

This procedure is meant for **corrective** maintenance (when the tape cutter makes irritating noises while cutting).

1. Required special materials

- Gloves
- Ethanol
- Feeler gauge 0.1 mm

2. Prerequisites

- Remove the trolley from the machine.
- Remove the run-in (4 Allen bolts and 2 torx screws).

3. Clean tape cutter

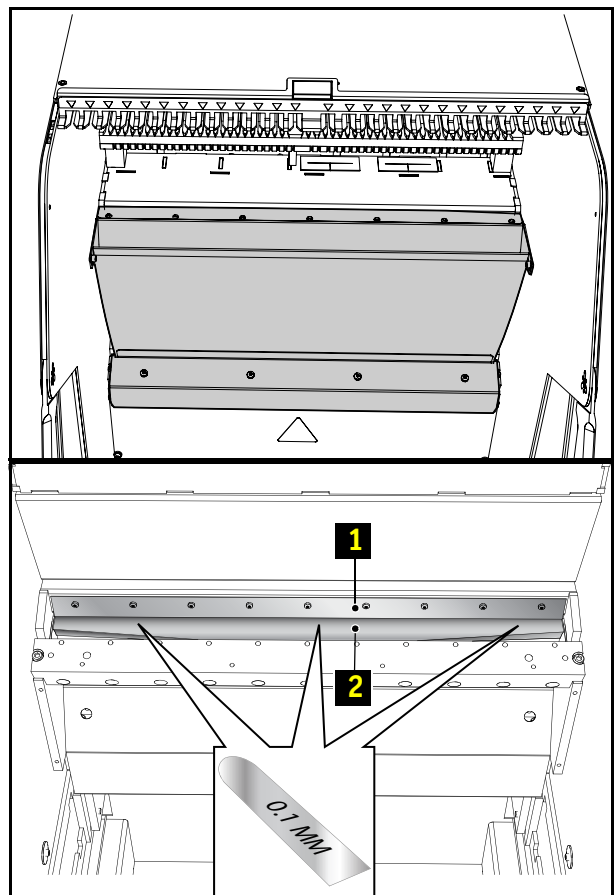
- Wear protective rubber gloves.
- Clean the stationary and rotating knife with tissue and ethanol.

4. Adjust the scraper

- Open the trolley back door and rotate the motor axis to access the entire surface of the rotating knife (2).
- Loosen the scraper bolts (9 Allen bolts), push the scraper (1) upwards and tighten 2 bolts.
- Place the 0.1 mm feeler gauge between the scraper (1) and the rotating knife (2).
- Loosen the bolts of the scraper (1). Push the scraper down evenly and fasten the bolts.
- Remove the feeler gauge.

5. Finalize

- Place the run-in (4 Allen bolts and 2 torx screws).



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CHAPTER E8 Spare parts, installation and replacement instructions

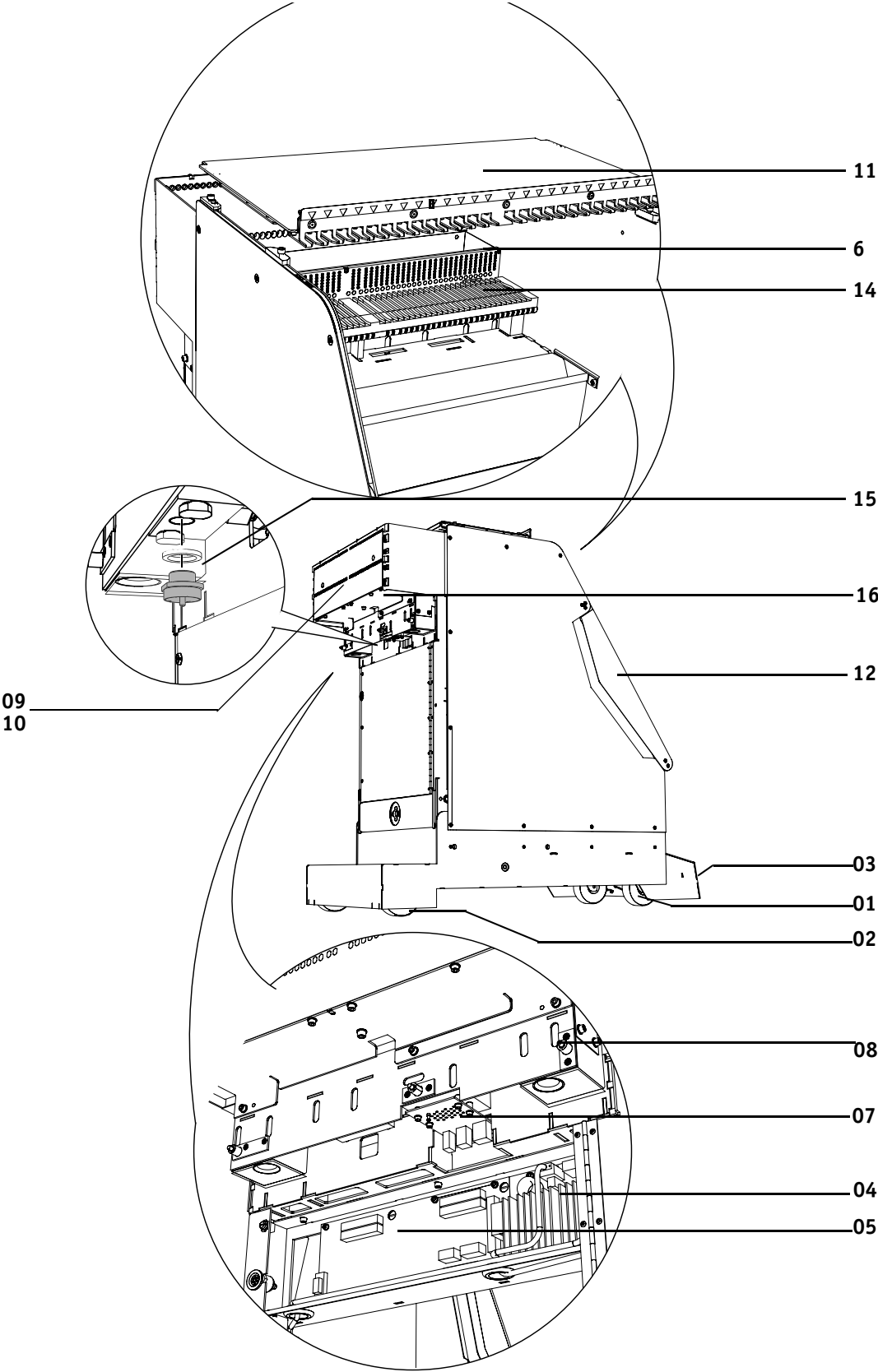
E8.1 Repair policy of trolleys

The feeder trolley can be fully repaired at the customer site. All main parts are available as a spare part. None of these parts are defined as an Assembleon repairable part. The feeder trolley as a complete module is not defined as a spare part.

E8.2 A-series feeder trolley and feeder bank, spare parts

The spare parts of the feeder trolley and feeder bank are the same.

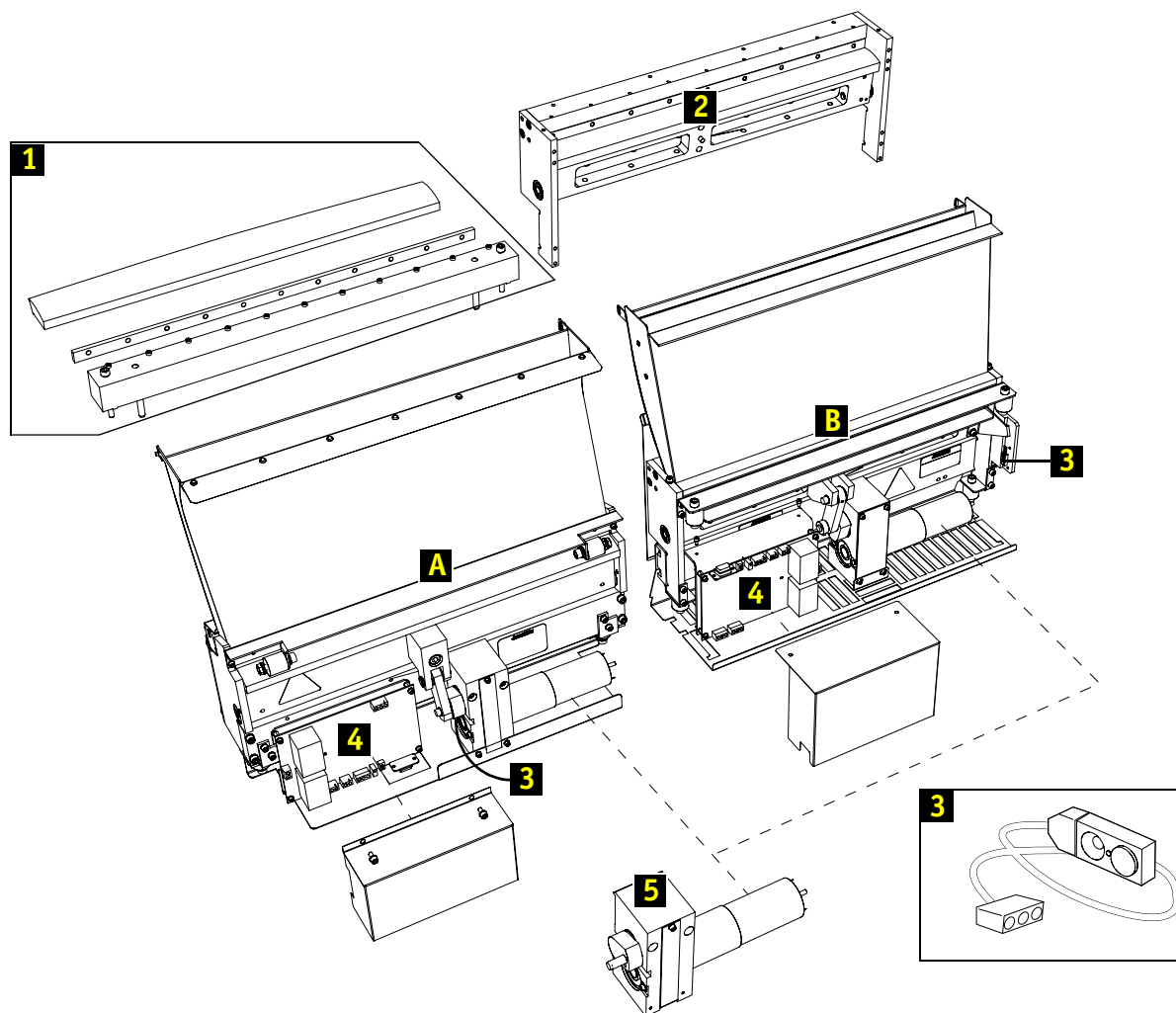
Current spare parts list, see http://espares.assembleon.com								
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	Remarks
1		9498-396-00440	Swivelling wheel	2	Y	-	•	
2		9498-396-00441	Wheel	2	Y	-	•	
3		9498-396-00442	Footswitch	2	Y	-	•	
4		9498-396-00443	Trolley power supply board	1	Y	-	•	
5		9498-396-00866	Trolley controller board	1	Y	-	•	
6		9498-396-00445	Feeder interface electrical board	1	Y	-	•	
7		9498-396-00446	Trolley interface electrical board	1	Y	-	•	
8		9498-396-00125	Contact pen	3	Y	-	•	
9		9498-396-01164	Feeder interface front plate	1	Y	-	•	For PA 2632/05, PA 2632/15 and newer
10		9498-396-00449	Feeder interface front plate	1	-	-	•	Only for PA 2632/00) and project number 9466-920-10631
11		9498-396-00451	Upper feeder guide	1	Y	-	•	
12		9498-396-00452	Handle	1	Y	-	•	
14		9498-396-00458	Bottom feeder guide	1	Y	-	•	Part of trolley upgrade air (PA 2632/10)
15		9498-396-00121	Air ram	1	Y	-	•	Part of trolley upgrade air (PA 2632/10)
16		9498-396-00561	Component bin	1	Y	-	•	Only for PA 2632/05, PA 2632/15



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E8.2.1 Tape cutter, spare parts

Current spare parts list, see http://espaes.assembleon.com								
Item No	A (4022-516-1330x)	B (4022-512-5527x)	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
A	•	-	9498-396-01676	Tape cutter R2	1	-	-	• Also valid as replacement for type B
1	•	-	9498-396-01677	Knives R2	1	-	-	• Adjustment bracket and feeler gauge included
2	-	•	9498-396-00454	Knives R1	1	-	-	•
3	•	•	9498-396-00455	Sensor	1	-	-	• Cable included
4	•	•	9498-396-00456	Tape cutter controller	1	-	-	•
5	•	•	9498-396-01943	Drive unit	1	-	-	• Motor, gearbox and cable included



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E8.3 A-series feeder trolley and feeder bank, replacement of components

The replacement instructions for parts of the feeder trolley and feeder bank are the same.

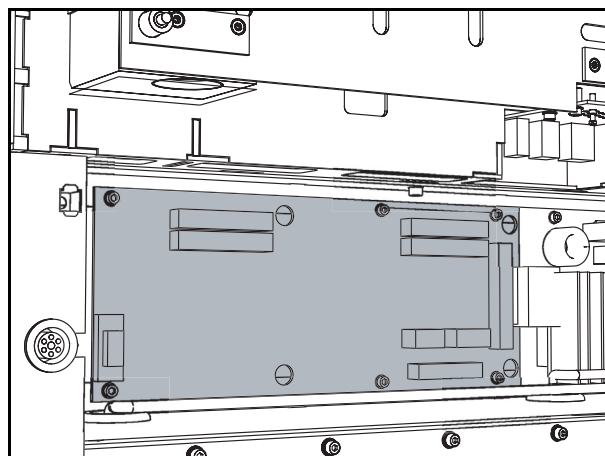
E8.3.1 Trolley controller board, replacement

1. Prerequisites

- Open the lid to the trolley power supply.

2. Replace the trolley controller board

- Remove the trolley controller board (6 Allen bolts).
- Disconnect all cables to the trolley controller board.
- Installation in reverse order.



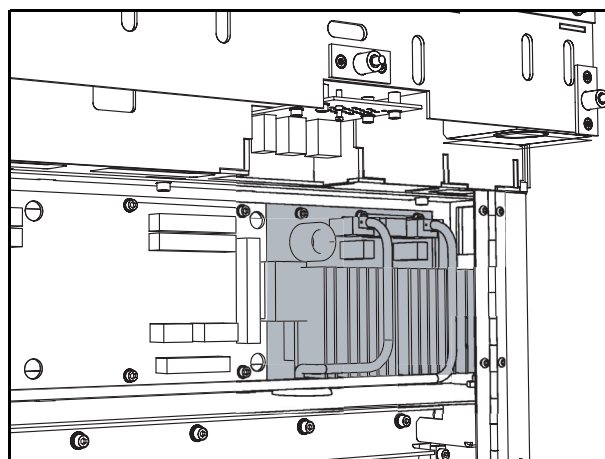
E8.3.2 Trolley power supply board, replacement

1. Prerequisites

- Open the lid to the trolley power supply.

2. Replace the trolley power supply board

- Disconnect all cables to the trolley power supply board.
- Remove the trolley power supply board (6 Allen bolts).
- Installation in reverse order.



E8.3.3 Feeder interface electrical board, replacement

1. Prerequisites

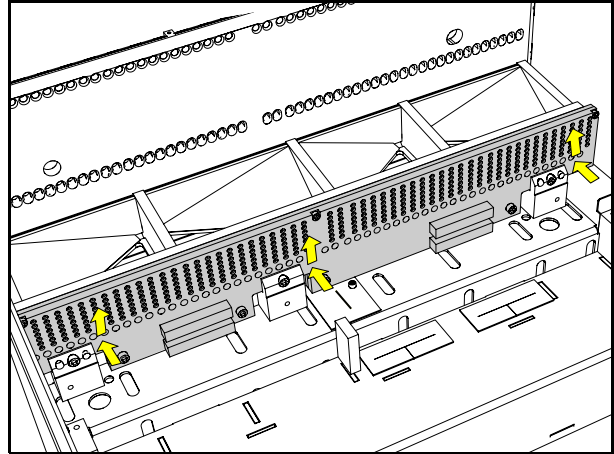
- Remove the upper feeder guide, see [E8.3.7](#).
- Remove the bottom feeder guide, see [E8.3.9](#).

2. Remove feeder interface electrical board

- Disconnect all cables to the feeder interface electrical board.
- Remove all bolts and remove the feeder interface electrical board from its dowels.

3. Install feeder interface electrical board

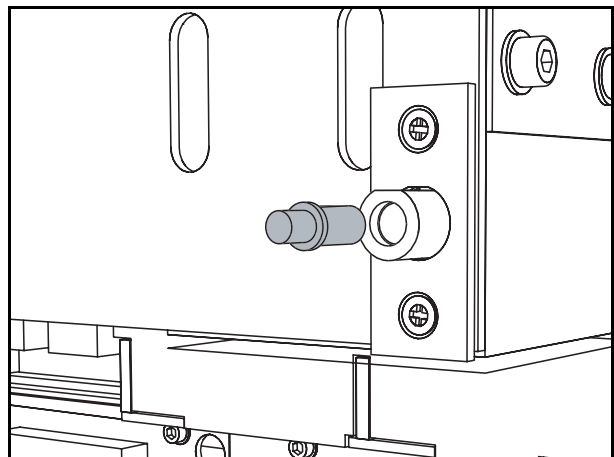
- Installation in reverse order.



E8.3.4 Contact pen, replacement

1. Replace the contact pen

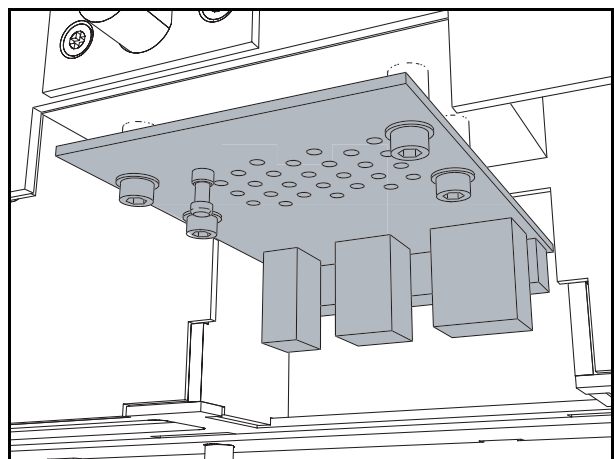
- Remove the contact pen with pliers.
- Push the new contact pen into the contact pen housing.



E8.3.5 Trolley interface electrical board, replacement

1. Replace the trolley interface electrical board

- Remove the 4 Allen bolts that fasten the trolley interface electrical board to the trolley.
- Disconnect all cables to the trolley interface electrical board.
- Installation in reverse order.



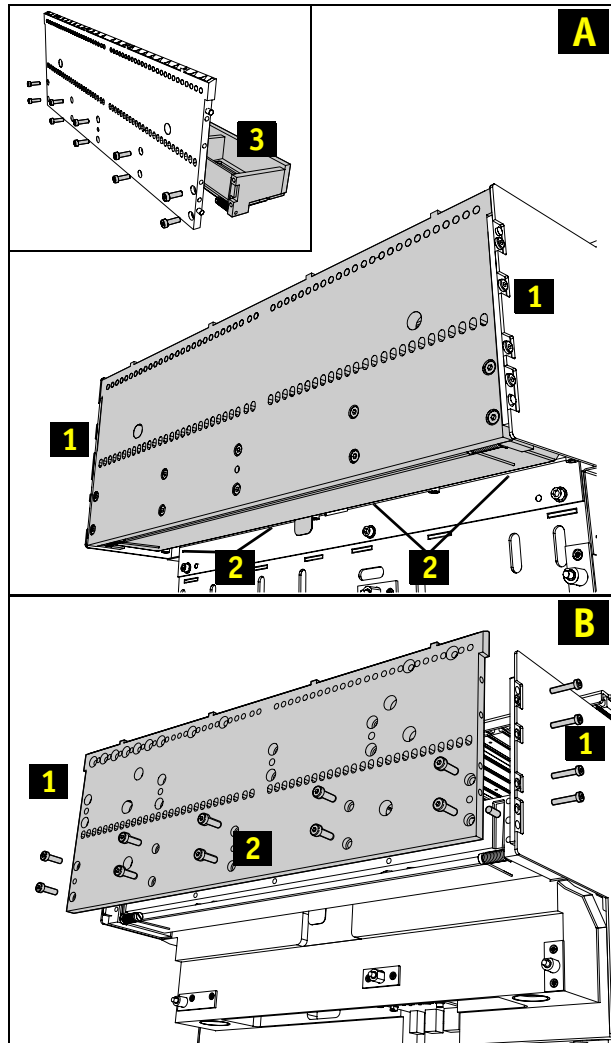
E8.3.6 Feeder interface front plate, replacement

1. Remove feeder interface front plate

This spare part has 2 technical versions (A,B):

Type A:

- Remove 2x4 Allen bolts on the side (1) and 4 Allen bolts on the bottom (2) of the feeder interface front plate.
- Bend the side plates and remove the feeder interface front plate (including the stiffness bar).
- Remove the stiffness bar (3) from the feeder interface front plate (10 Allen bolts).



Type B:

- Remove 2x4 Allen bolts on the side (1) and 10 Allen bolts on the front (2) of the feeder interface front plate.
- Bend the side plates and remove the feeder interface front plate.

2. Install feeder interface front plate

- Installation in reverse order.

3. Ensure accuracy

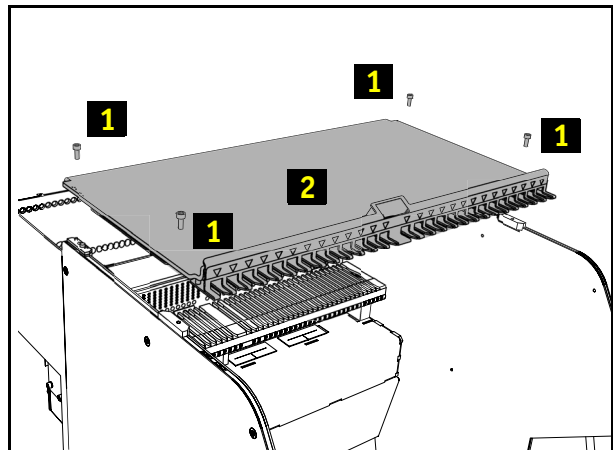
Note: Follow these steps in the correct order to ensure accuracy.

- Loosen all bolts one stroke.
- Tighten the bolts (1) and (3).
- Finally tighten the bolts (2).

E8.3.7 Upper feeder guide, replacement

1. Replace the upper feeder guide

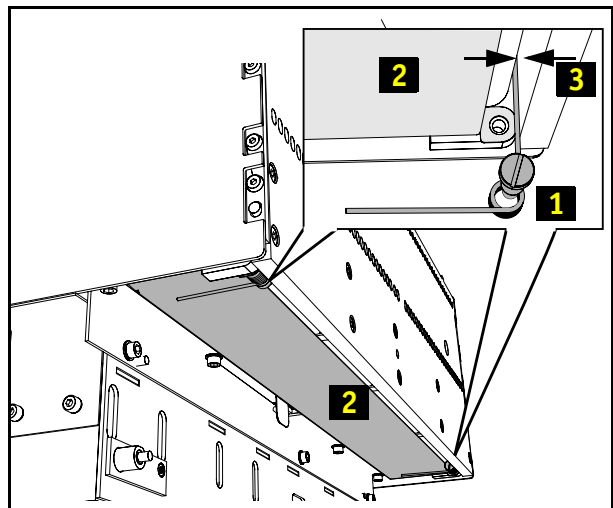
- Remove the Allen bolts (1).
- Remove the upper feeder guide (2) from its dowels.
- Installation in reverse order.



E8.3.8 Component bin, replacement

1. Replace the component bin

- Remove the 2 screws and springs (1).
- Remove the component bin (2).
- Installation in reverse order.
- Make sure to place one end of the spring (3) between the feeder interface front plate and the stiffness bar.



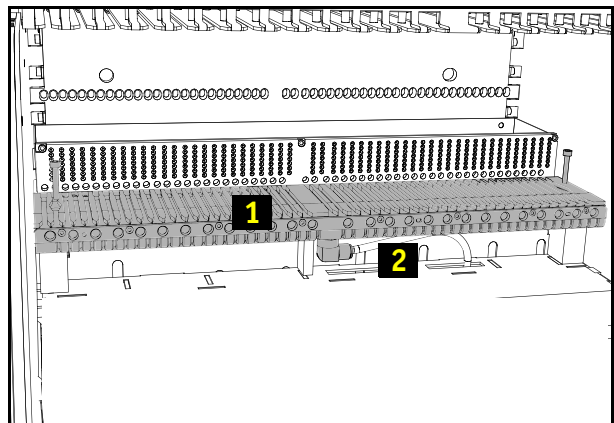
E8.3.9 Bottom feeder guide, replacement



NOTE: This item is a part of the trolley upgrade air (PA 2632/10), and the air hose on this item is meant for air supply to bulk feeders.
The feeder guide function used to guide all feeders.

1. Replace the bottom feeder guide

- Remove the bottom feeder guide (1) (Allen bolts).
- Disconnect the air hose (2).

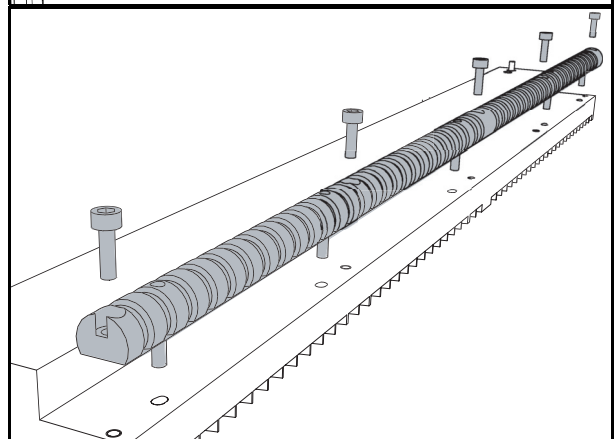


2. Transfer the shaft

- Transfer the shaft to the new bottom feeder guide.

3. Install the bottom feeder guide

- Installation is in reverse order, be careful not to clamp the flat cable.



E8.3.10 Air ram, replacement



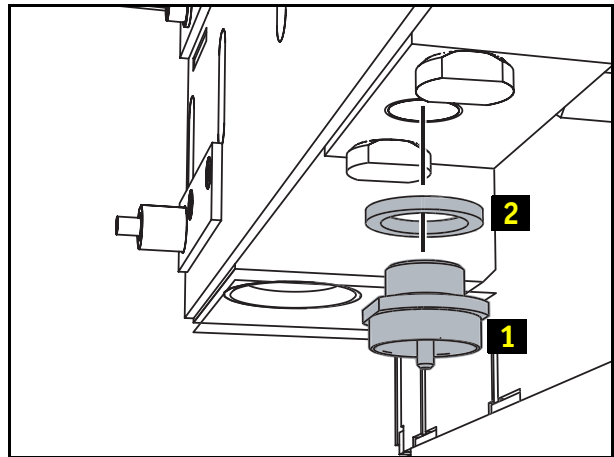
NOTE: This item is a part of the trolley upgrade air (PA 2632/10), and meant for air supply to bulk feeders.

1. Replace the air ram

- Remove the air ram (1) using an open end wrench.

Note: Be careful not to lose the sealing (2).

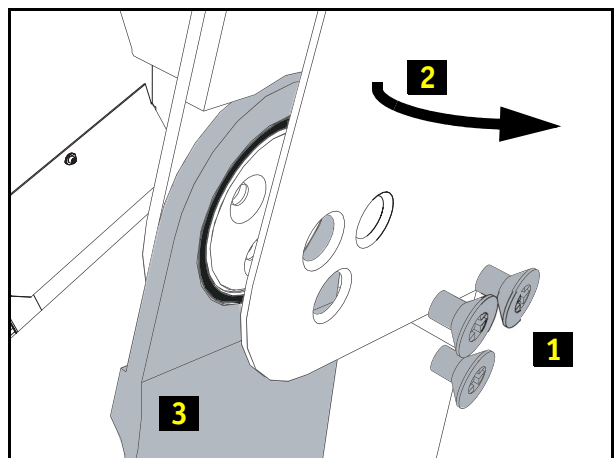
- Installation in reverse order.



E8.3.11 Trolley handle, replacement

1. Replace the trolley handle

- Remove the screws (1) from the handle.
- Push the trolley side plate (2) to the side.
- Remove the handle (3).
- Installation in reverse order.



E8.3.12 Trolley foot switch, replacement



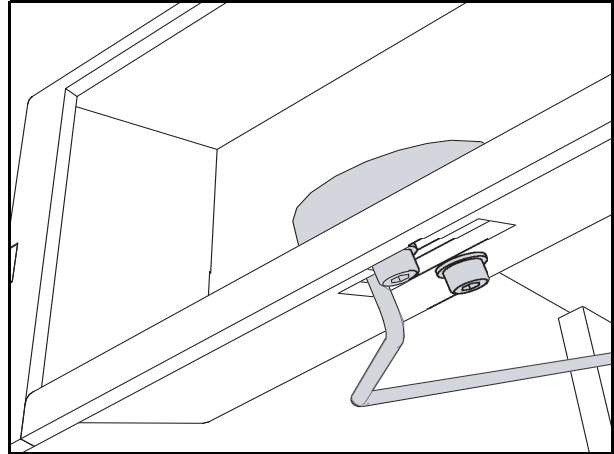
HEAVY OBJECT (± 103 kg)
Improper lifting method may cause injury.
Use proper tools to lift the object.

1. Prerequisites

- Carefully place the trolley on its side, using two persons.

2. Replace the trolley foot switch

- Cut the tie wraps that keep the foot switch cable in place.
- Remove the foot switch (2 Allen bolts and 1 cable)
- Installation in reverse order.



E8.3.13 Trolley wheels, swivelling wheels, replacement



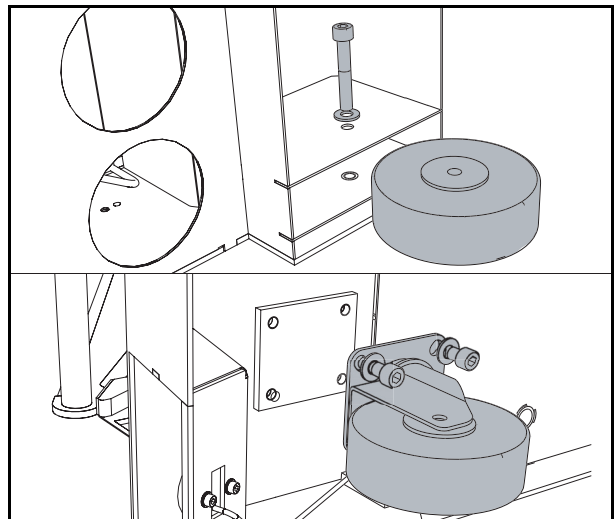
HEAVY OBJECT (± 103 kg)
Improper lifting method may cause injury.
Use proper tools to lift the object.

1. Prerequisites

- Carefully place the trolley on its side, using two persons.

2. Replace the trolley wheels

- Remove the (swivelling) wheel (2 Allen bolts)
- Installation in reverse order.



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E8.4 Tape cutter 4022-516-1330x, replacement of components

- Tape cutter identification, see [E3.3](#)

E8.4.1 Tape cutter, replacement



HEAVY OBJECT (± 20 kg)
Improper lifting method may cause injury.
Use proper tools to lift the object.



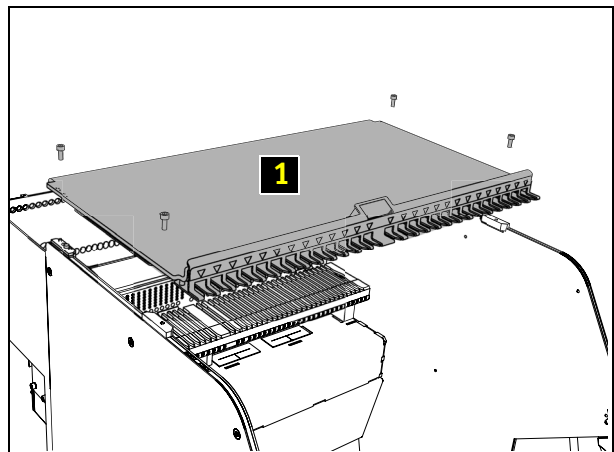
CUTTING HAZARD
Serious injury to body parts.
Use gloves when handling.

1. Required special materials

- Gloves
- Mirror
- Wooden beam of 459 mm (included in packaging of tape cutter).

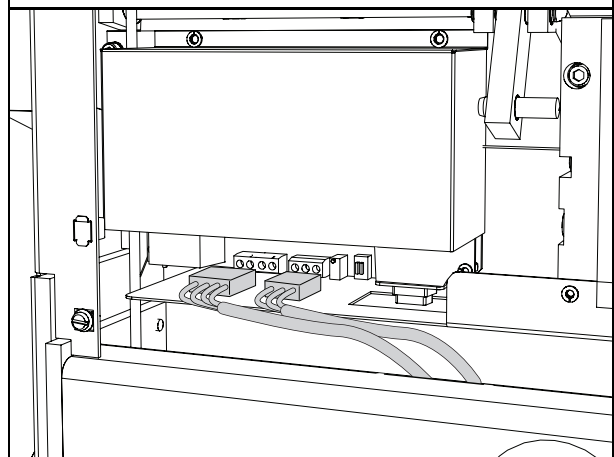
2. Prerequisites

- Remove the upper feeder guide (1).



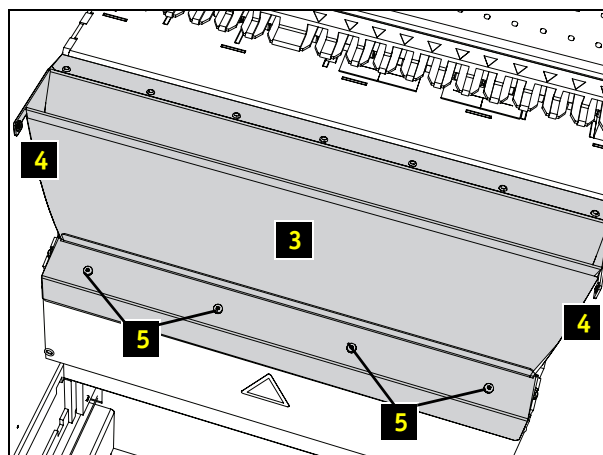
3. Disconnect tape cutter

- Disconnect cables marked with 'TCU X6' and 'X2'.



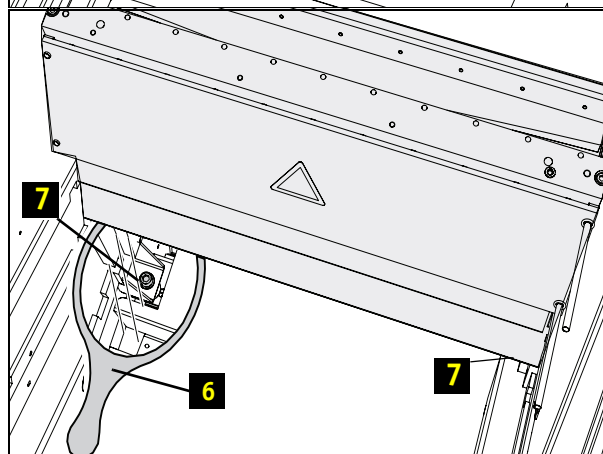
4. Remove run-in from tape cutter

- Remove the upper and lower bolts (4,5).
- Remove the run-in (3) from the tape cutter.



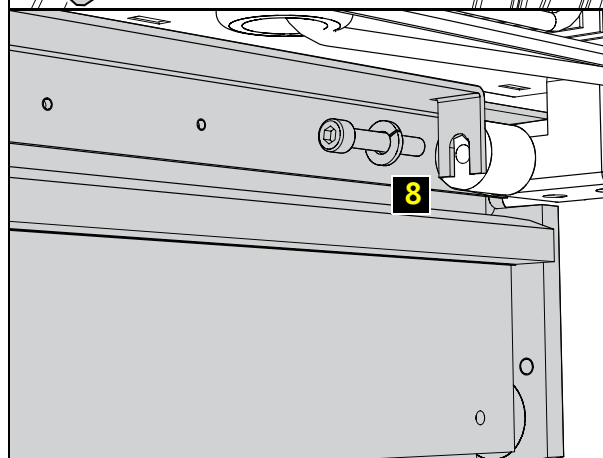
5. Remove the lower bolts

- Use a mirror (6). Removing of the bolts (7) is easiest when using a straight 6mm socket screw wrench.



6. Remove the upper bolts

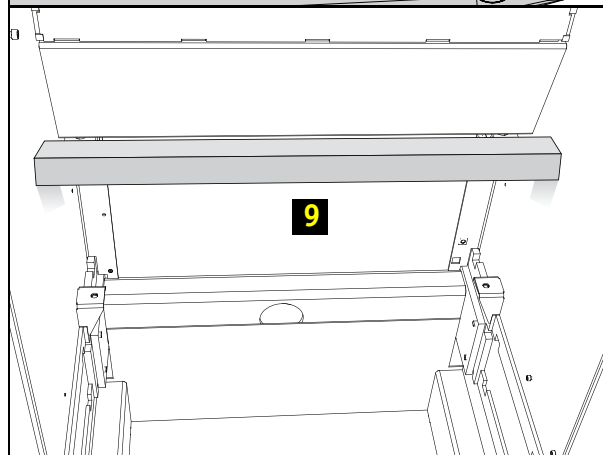
- Remove the upper bolts (8) from the rubber studs.



7. Create space for tape cutter handling

- Place a wooden beam of 459 mm (9) between the side plates of the trolley. The plates are pushed outwards a bit, so removal becomes easier.

Note: The beam is included in the packaging of the tape cutter.



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8. Remove the tape cutter

Use gloves when handling because of cutting hazard.

- Raise the tape cutter (10) by one person at the left and one at the right side of the trolley.

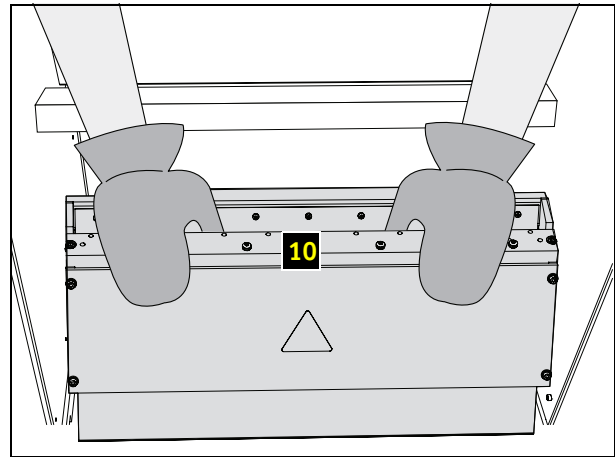
9. Installation

- Installation in reverse order.

Note: Lower the tape cutter (10) by one person at the left and one at the right side of the trolley. A third person at the back positions the tape cutter in the feeder trolley.

10. Testing the tape cutter functions

- Place feeder trolley on the machine.
The Tape cutter cuts 1 or 2 times after power up, depending on feeders on board.
- Place an ITF or TTF feeder in the trolley.
The tape cutter cuts one time.
- Index the feeder.
Tape cutter will cut 1 time.
- Check function of green LED:
 - * During cut phase the green LED of the tape cutter will not burn.
- Both green LEDs are burning before and after cut phase.



E8.4.2 Knife assembly, replacement



HEAVY OBJECT (± 20 kg)
Improper lifting method may cause injury.
Use proper tools to lift the object.



CUTTING HAZARD
Serious injury to body parts.
Use gloves when handling.

1. Required special materials

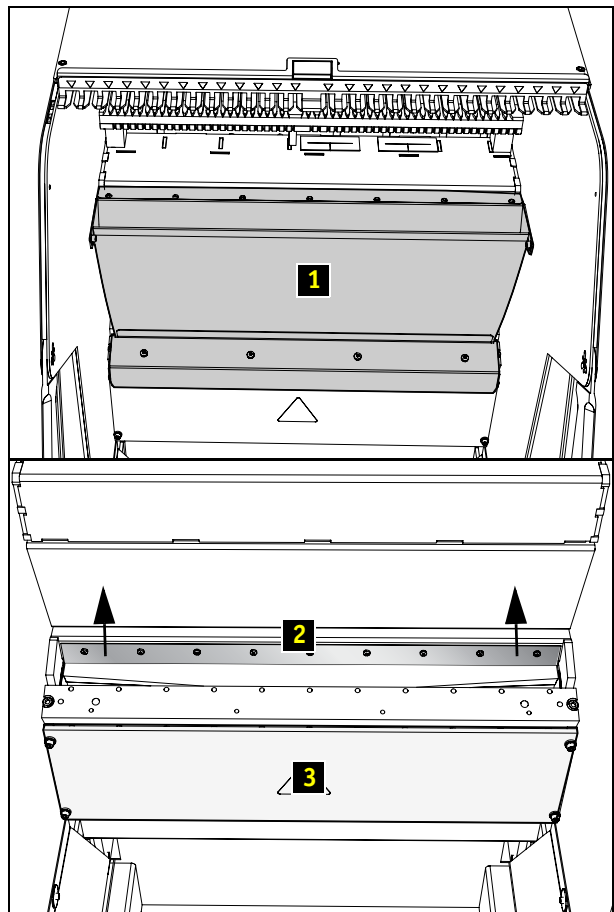
- Gloves and feeler gauge 0.1 mm
- Knife adjustment tool (included in packaging of spare part).
- Feeler gauge 0.04 mm (included in packaging of spare part).

2. Prerequisites

- Remove the trolley from the machine.
- Remove the run-in (1) (4 Allen bolts and two torx screws).

3. Make knife accessible

- Remove the plastic cover plate (3) (4 Allen bolts).
- Loosen the scraper bolts (9 Allen bolts), push the scraper (2) upwards and tighten 2 bolts.

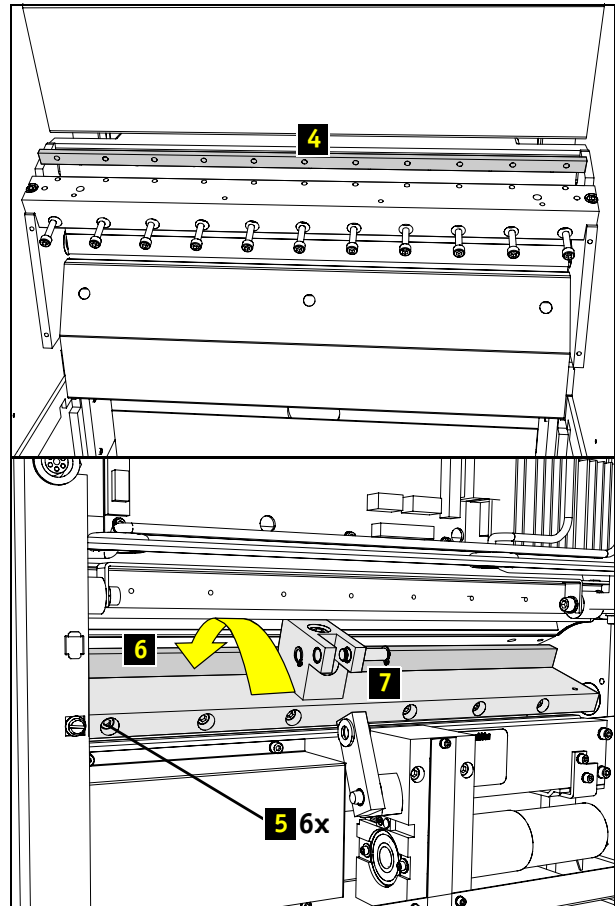


4. Remove stationary knife

- Remove the stationary knife (4) (11 Allen bolts).

5. Rotate the knife

- Open the trolley back door.
- Remove the circlip of the hinge between the rotating knife and the drive unit. Remove the hinge axis (7).
- Rotate the rotating knife to access the bolts (5) that hold the rotating knife (6).

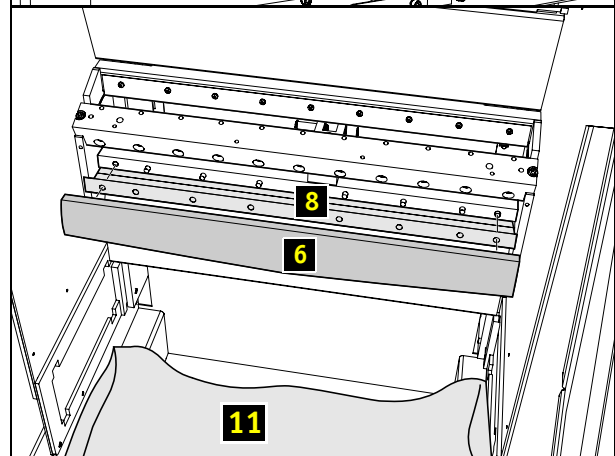


6. Remove rotating knife

- Cushion the bottom of the trolley (11), so the loose rotating knife (6) will not cause damage, or have a second person holding the rotating knife (wearing gloves) and loosen the (6 Allen) bolts (5). Start with the bolts on the side of the tape cutter controller.

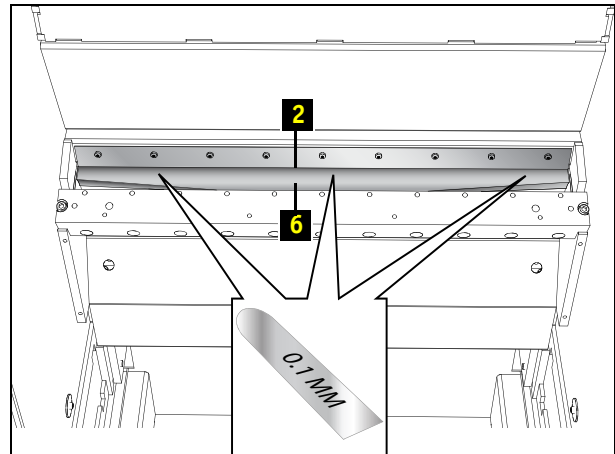
7. Install rotating knife

- Position the flexing plate (8) on the dowels.
- Place the new rotating knife (6) over the dowels.
- Start with the bolts (6) on the side of the tape cutter motor.



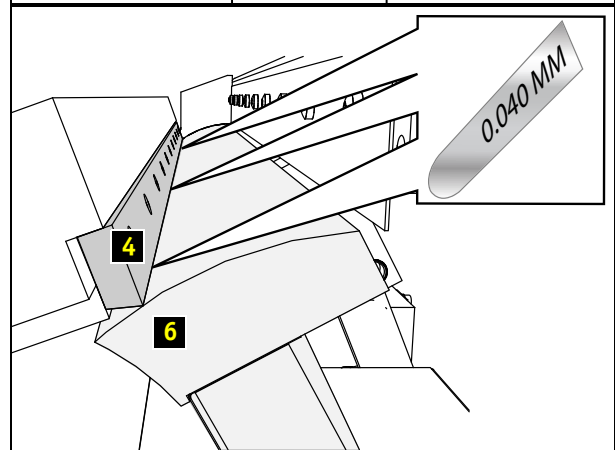
8. Adjust scraper

- Rotate the motor axis so the hinge axes are in one vertical line and insert the hinge axis (no circlip yet). The knife is now locked in position.
- Place the 0.1 mm feeler gauge between the scraper (2) and the rotating knife (6).
- Loosen the bolts of the scraper. Push the scraper down evenly and fasten the bolts.



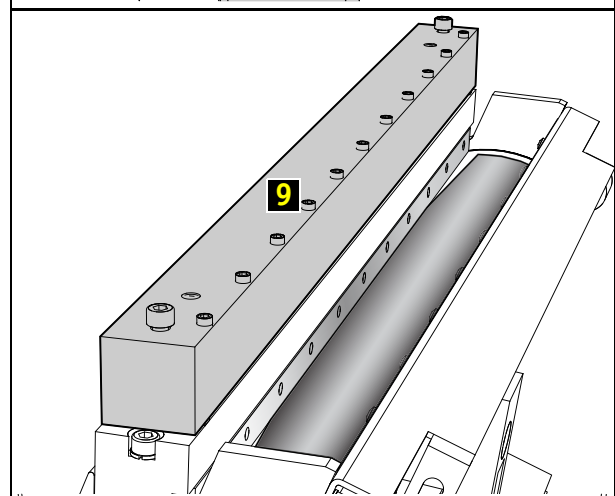
9. Install stationary knife

- Place the 0.04 mm feeler gauge between the stationary knife location and the rotating knife (6).
- Place the stationary knife (4) with the correct side to the rotating knife and insert the bolts (10) loosely in the stationary knife.



10. Adjust stationary knife

- Place the knife adjustment tool (9).
- Finger tighten the bolts (10) from the inside to the outside.
- Hand tighten the bolts (10) from the inside to the outside.
- Fasten the bolts (10) from the inside to the outside.
- Remove the knife adjustment tool (9).
- Remove the feeler gauge.

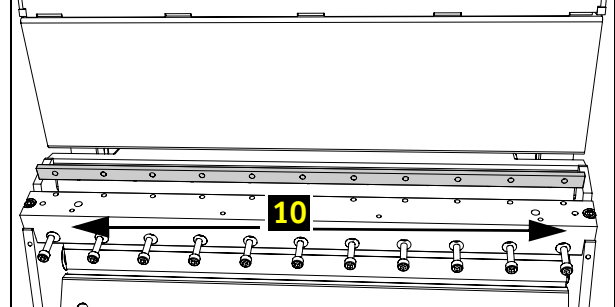


11. Test the tape cutter knife adjustment

- Remove the hinge axis (7).
- Check tape cutter: operate the rotating knife by hand.
When closing the knife, the stationary and rotating knife may not touch each other. Regular office paper should be cut OK over the full length of the knife.
- Insert the hinge axis (7) and place the circlip.

12. Finalize

- Place the plastic cover plate (3) (4 Allen bolts).
- Place the run-in (1) (4 Allen bolts and 2 torx screws).



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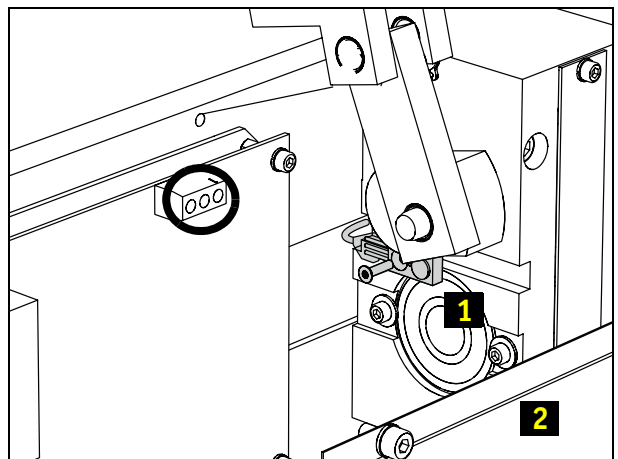
E8.4.3 Tape cutter sensor, replacement

1. Removing the sensor

- Open the lid to the tape cutter.
- Remove the cover (2) and disconnect the connector from the tape cutter sensor.
- Remove sensor (1) from drive unit (1 Torx screw).
- Remove sensor with cable.

2. Installing the sensor

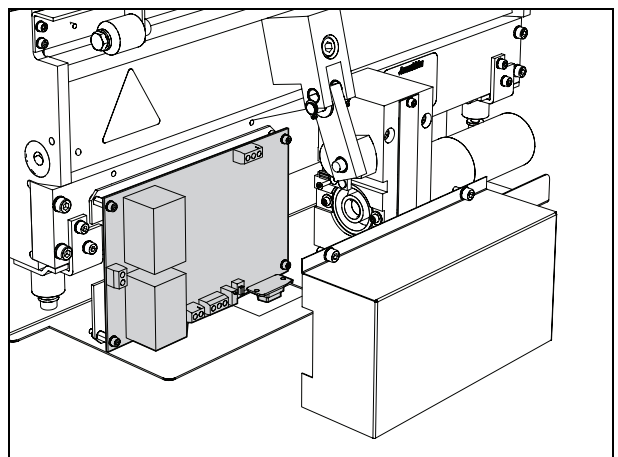
- Position new sensor with cable.
- Mount the sensor on the drive unit (1) (1 Torx screw). Apply Loctite 243.
- Secure sensor cable in the same way as the old one.
Connect the sensor cable to the tape cutter controller.
- Install the cover (2).



E8.4.4 Tape cutter controller, replacement

1. Replacing the tape cutter controller

- Open the lid to the tape cutter.
- Remove the cover.
- Disconnect all connectors from the tape cutter controller.
- Remove the tape cutter controller (4 Allen bolts).
- Installation in reverse order.



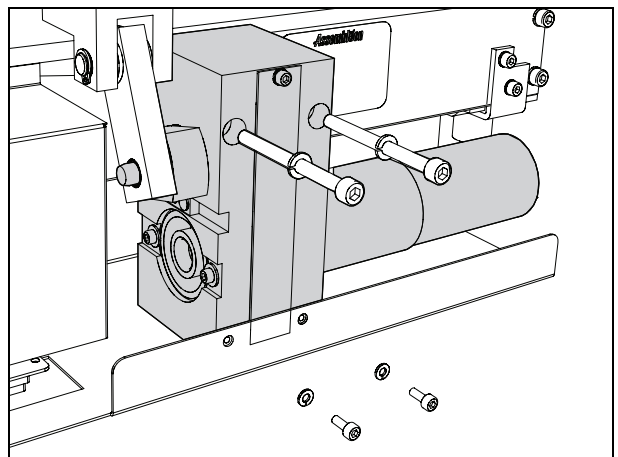
E8.4.5 Tape cutter drive unit, replacement

1. Removing the drive unit

- Open the lid to the tape cutter.
- Disconnect the sensor connector.
- Remove the bolts and take the drive unit out.

2. Installing the drive unit

- Transfer the tape cutter sensor, see [E8.4.3](#)
- Installation in reverse order.



E8.5 Tape cutter 4022-512-5527x, replacement of components

- Tape cutter identification, see [E3.3](#)

E8.5.1 Tape cutter, replacement



HEAVY OBJECT (± 20 kg)
Improper lifting method may cause injury.
Use proper tools to lift the object.



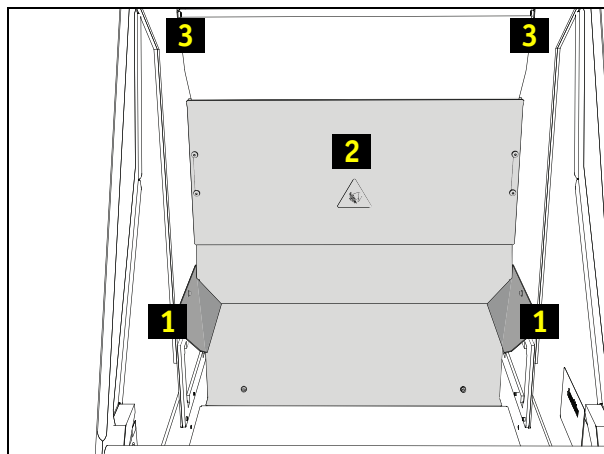
CUTTING HAZARD
Serious injury to body parts.
Use gloves when handling.

1. Prerequisites

- Remove the waste bin.
- Remove the upper feeder guide, see [E8.3.7](#).

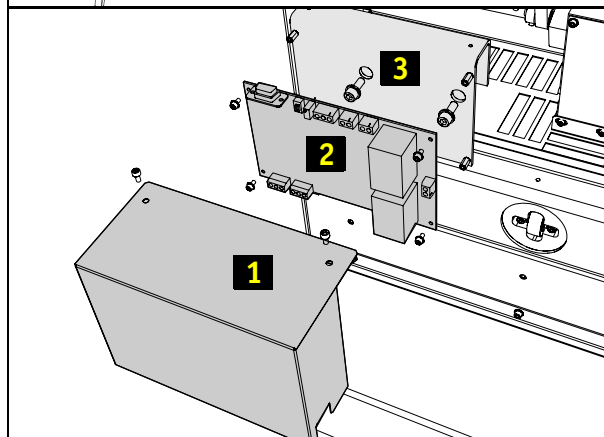
2. Remove the tape guide plates

- Remove the 2 side tape guide plates (1) (2x2 Allen bolts).
- Remove the 2 middle tape guide plates (2) (2x4 Allen bolts).
- Remove the 2 Allen bolts from the tape guide box (3).



3. Disconnect tape cutter

- Open the lid to the tape cutter.
- Remove cover (1).
- Disconnect the tape cutter controller (2).
- Mount cover (1).



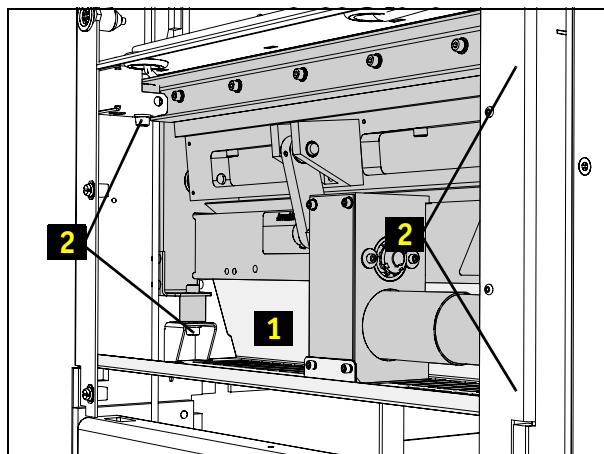
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4. Remove the tape cutter

- Remove protection cover (1).
- Remove the 4 Allen bolts (1) that fasten the tape cutter to the feeder trolley.
- Remove the tape cutter from the trolley, wear gloves and use two persons to lift it.

5. Install the tape cutter

- Installation in reverse order.



E8.5.2 Knife assembly, replacement



CUTTING HAZARD

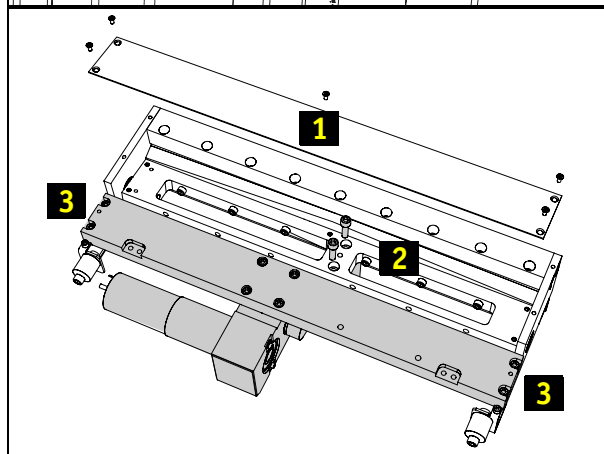
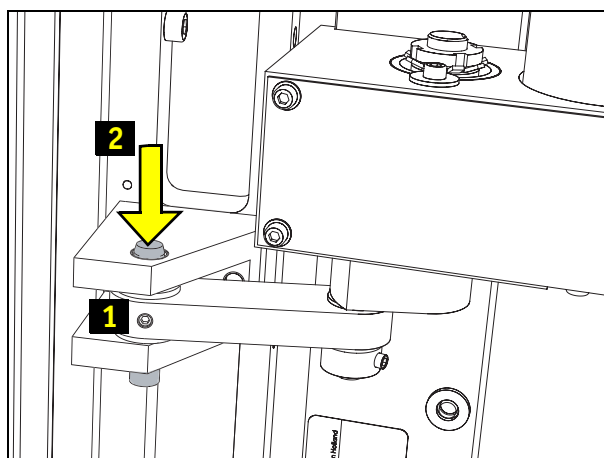
Serious injury to body parts.
Use gloves when handling.

1. Prerequisites

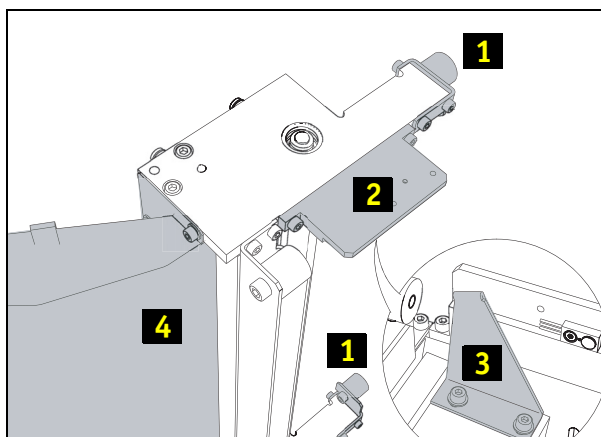
- Remove tape cutter from trolley, see [E8.4.1](#)
- Wear gloves and place the tape cutter on its side.

2. Disassembling

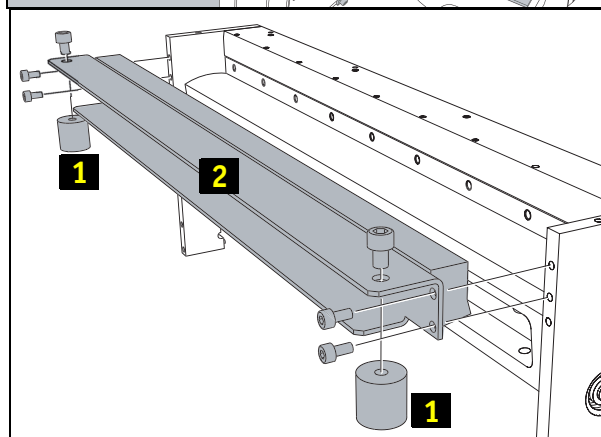
- Loosen the set screw (1) in the 'elbow' hinge pin. Rotate the knife if necessary, using an adjustable open end wrench.
- Remove the hinge pin (2) from the 'elbow' hinge, using a plastic hammer.
- Remove the knife cover plate (1), (5 torx screws).
- Remove the 'elbow' hinge (2) (2 Allen bolts).
- Remove the motor supporting bracket (3) from the knife assembly (4 Allen bolts).



- Remove the small fixing point brackets (1) from the knife assembly (2x3 Allen bolts).
- Remove the sensor bracket (2) from the knife assembly (2 Allen bolts).
- Remove the sensor trigger bracket (3) from the knife assembly (2 Allen bolts).
- Remove the tape guide box (4) (6 Allen bolts).

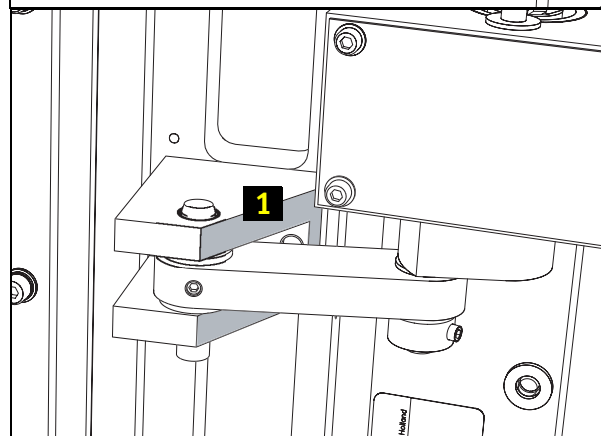


- Remove the rubber studs (1).
- Remove the large fixing point bracket (2), (2x2 Allen bolts).



3. Assembling

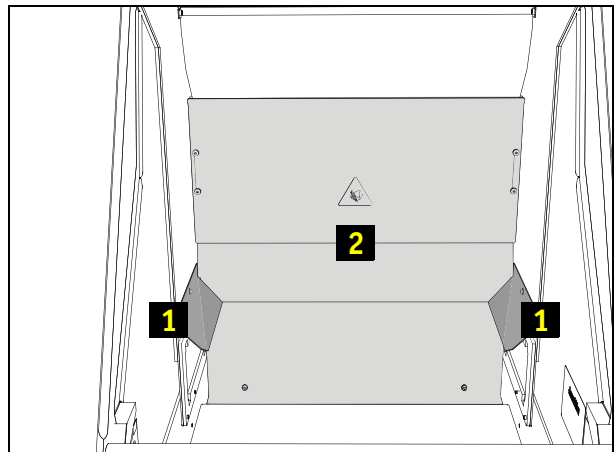
- Assembling in reverse order.
Place the 'elbow' hinge back with the skewed side (1) facing to the motor.
- Install the tape cutter in the trolley, see [E8.4.1](#)



E8.5.3 Tape cutter drive unit, replacement

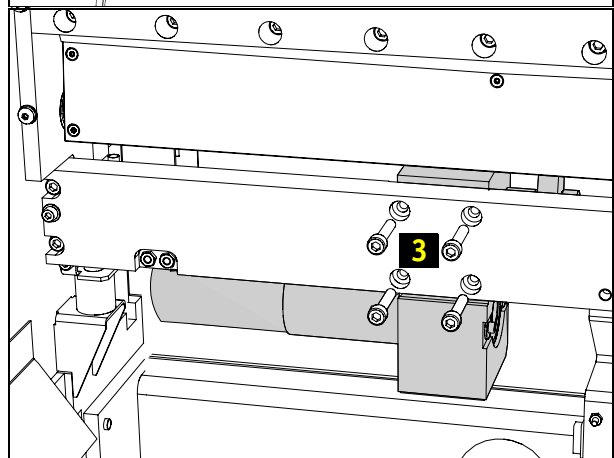
1. Remove covers

- Remove the 2 side tape guide plates (1) (2x2 Allen bolts).
- Remove the 2 middle tape guide plates (2) (2x4 Allen bolts).



2. Prerequisites

- Remove the drive unit bolts (3) (4 Allen bolts)

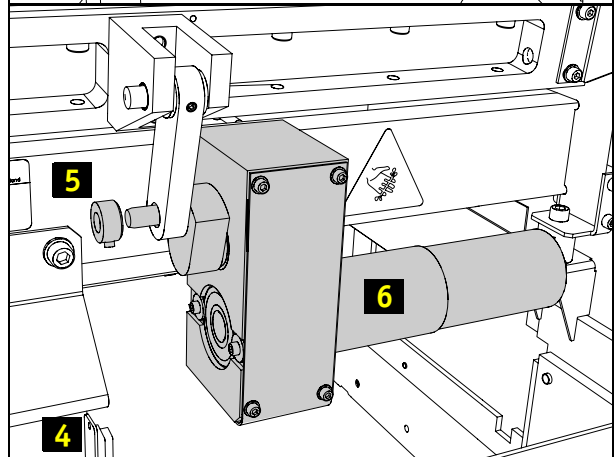


3. Remove the drive unit

- Open the lid to the tape cutter.
- Disconnect the connector (4) from the drive unit.
- Remove the lock ring (5).
- Take the drive unit (6) out.

4. Install the drive unit

- Installation in reverse order.



E8.5.4 Tape cutter sensor, replacement

1. Prerequisites

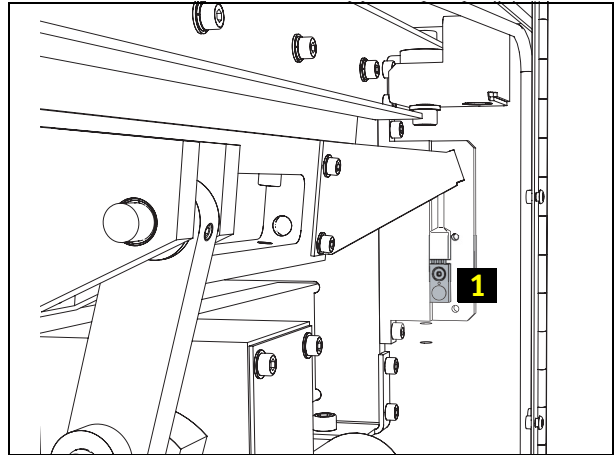
- Open the lid to the tape cutter.
- Disconnect the sensor connector from the tape cutter controller.

2. Remove the tape cutter sensor

- Cut the tie wraps that keep the sensor cable in place.
- Remove the sensor (1) (1 Torx screw).

3. Install the tape cutter sensor

- Installation in reverse order.
- Adjust the sensor clearance, see [E6.4](#).



E8.5.5 Tape cutter controller, replacement

1. Prerequisites

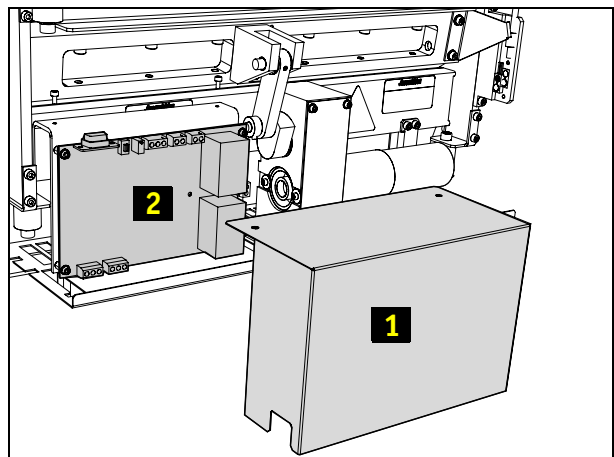
- Open the lid to the tape cutter.

2. Replace the tape cutter controller

- Remove cover (1), (2 Allen bolts)
- Disconnect all cables from the tape cutter controller (2).
- Remove the tape cutter controller (2) (4 Allen bolts).

3. Finalize

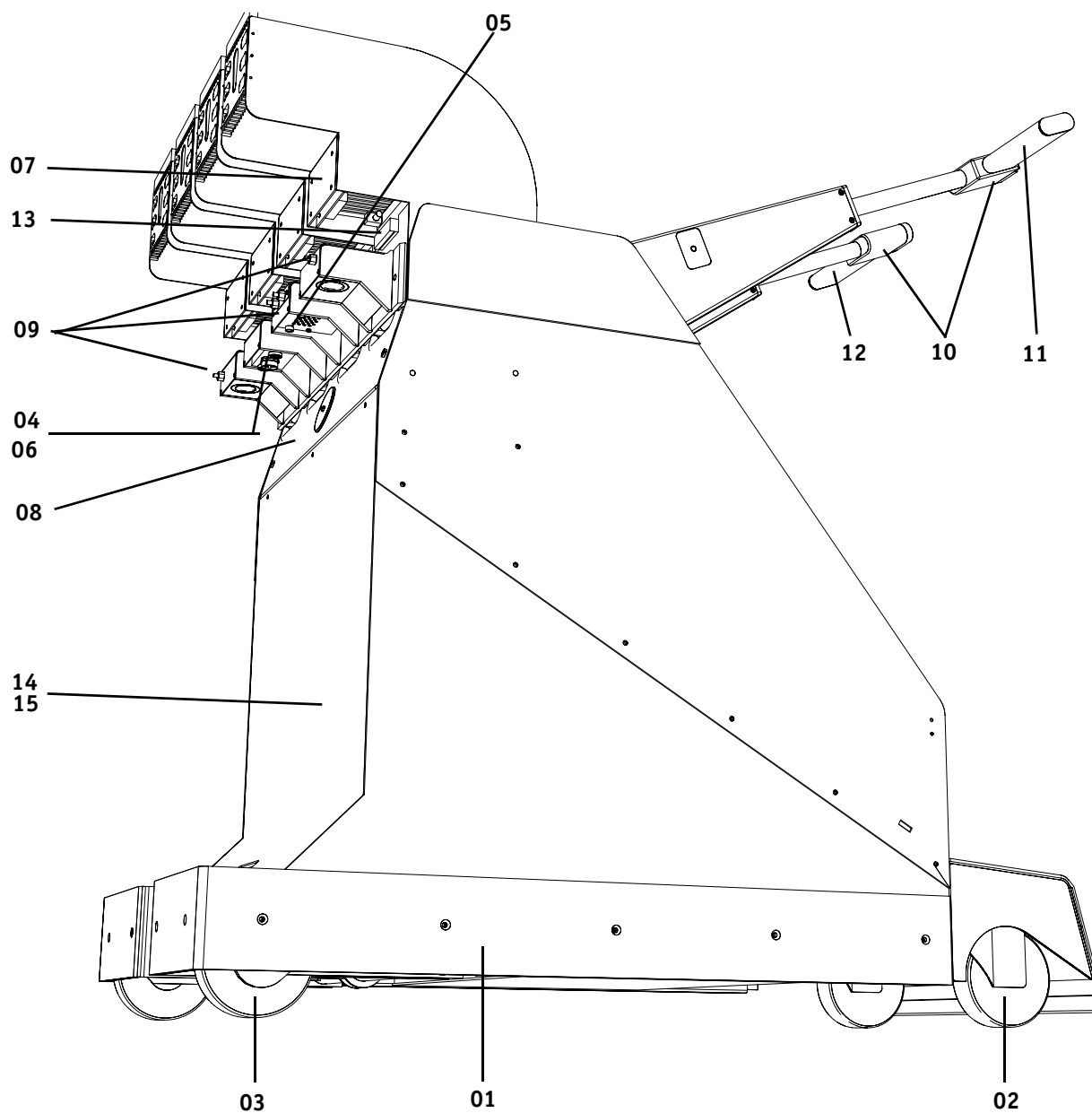
- Installation in reverse order.
- Settings, see [E5.3.2.1 Tape cutter controller, connections and settings](#)



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E8.6 FCM feeder trolley for AX-301/501, Upgraded FCM feeder trolley, spare parts

Current spare parts list, see http://espares.assembleon.com					Qty/ Mod	Priority indicator	Repair options	Replacement instruction	Remarks
Item No.	Part of Item No.	Ordering Code	Description						
1		9498-396-00117	Bumper strip	1	Y	-	-		
2		9498-396-00120	Swivelling roller	2	Y	-	-		
3		9498-396-00119	Wheel	2	Y	-	-		
4		9498-396-00121	Air ram	1	Y	-	-		
5		9498-396-00100	Trolley interface board	1	Y	-	-		
6		9498-396-00124	O-ring 13.4x18x2.0 pvc	1	Y	-	-		
7		9498-396-00099	Feeder interface board	4	Y	-	-		
8		9498-396-00101	Assy power converter	1	Y	-	-	Behind lid.	
9		9498-396-00125	Contact pin	3	Y	-	-		
10		9498-396-00106	Rocker switch aml24	2	Y	-	-		
11		9498-396-00114	Rocker switch operator l	1	Y	-	-		
12		9498-396-00115	Rocker switch operator r	1	Y	-	-		
13		9498-396-00108	Air valve	8	Y	-	-		
14		9498-397-00589	FCM trolley for AX refurbished	1	-	RO	-	Only for trolleys without SVS-PRO	
15		9498-398-00589	FCM trolley for AX customized repair	1	-	RC	-	For all trolleys	



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E8.7 FCM trolley for AX (PA 2631/10) / Upgraded FCM feeder trolley (PA 2631/00), replacement of components

E8.7.1 Air valve, replacement

1. Prerequisites

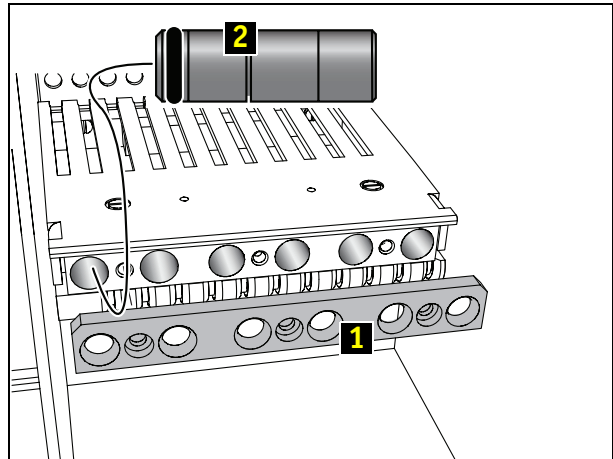
- Remove the feeders from the trolley.
- Cut off the air-pressure.

2. Replace air valve

- Remove the interface guide plate (1).
- Remove the old air valve (2) by screwing an M5 bolt/screw into the air valve and pull the air valve carefully out of the air block.

Note: Possible sticking air valves can be removed with a left turning conical tap.

- Make sure that the hole is clean and free of grease.
- Place the new air-valve in the holes (2).
- Replace the interface guide plate.



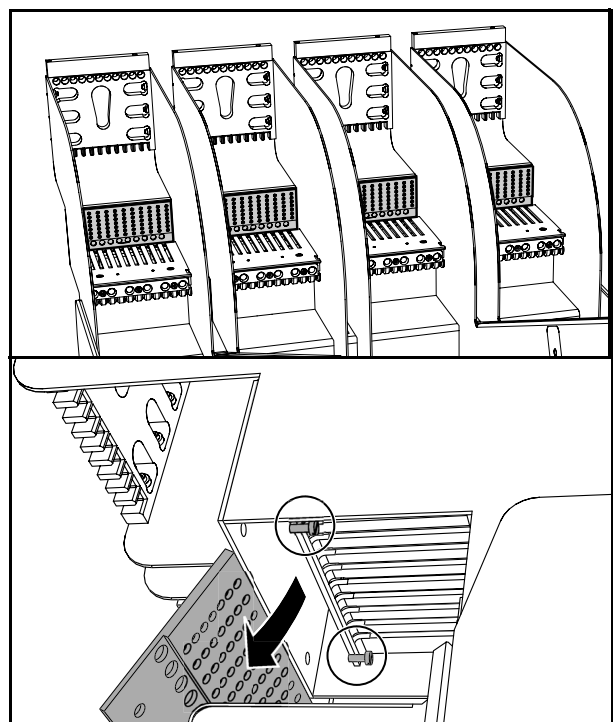
E8.7.2 Feeder interface board, replacement

1. Feeder interface board, removal

- Release the connector from the feeder interface board.
- Remove the feeder interface board by releasing 2 Allen bolts.

2. Installation

- Install the new feeder interface board in reverse order.
- Verify the correct position of the feeder interface board by using a feeder on the first, middle and last feeder-position. All pins should make contact.
- Double check the feeder interface board function by testing the feeder on the trolley on a machine.



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F. VISION

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CHAPTER F1 Introduction

F1.1 General

The vision system determines the position of the board in the transport area and the position of the component on the placement head after being picked.

F1.1.1 Overview

Main parts of the vision system:

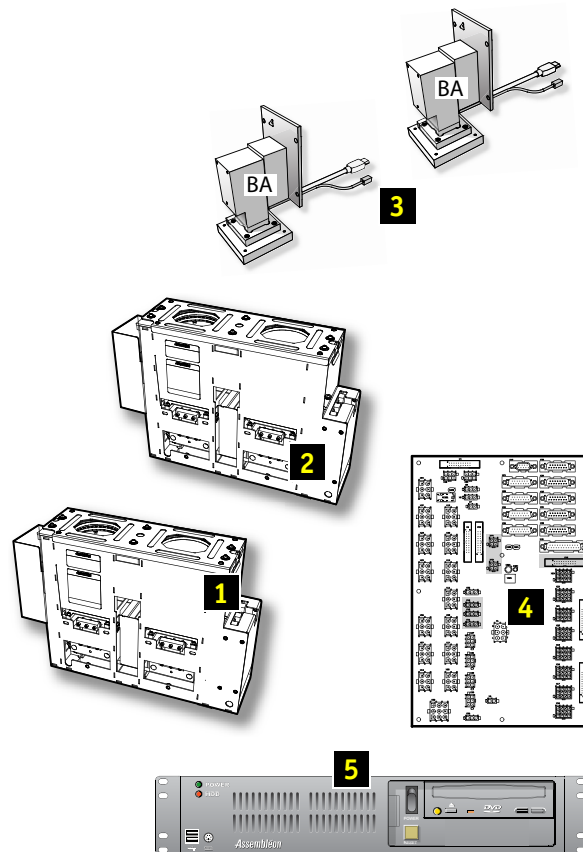


Figure 1 Vision system, overview

1. CV (component vision) camera front
2. CV (component vision) camera rear
3. BA (board alignment) camera, front and rear
4. Interconnection board base (IBB)
5. System controller.

CHAPTER F2 Safety and ergonomics

The vision system is part of the whole machine.

Safety and ergonomics is only described for the machine as a whole.

CHAPTER F3 Technical specifications

F3.1 Identification

F3.1.1 CV camera, identification

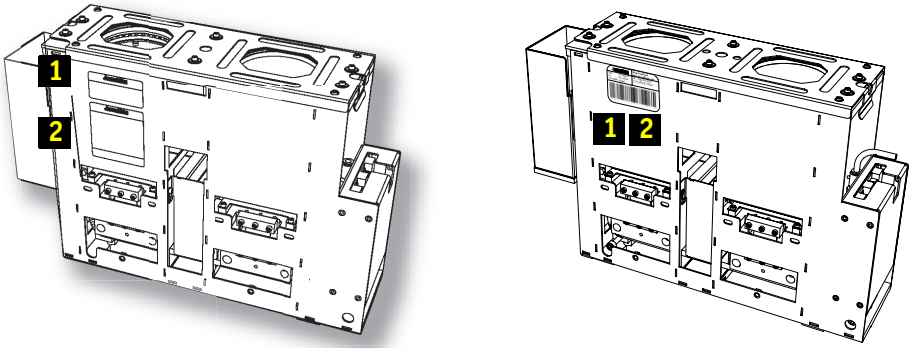


Figure 2 CV camera, identification

No.	Description	Format	Occurrences
1	Technical identification	12 digit number, last digit marked at bottom of sticker.	
2	Commercial identification	6 digit PA-number. 6 digit DC-number.	PA 1863/10 (SFOV) PA 1862/10 (LFOV)

Figure 3 CV camera, identification

CHAPTER F4 Functional description

F4.1 Vision system, overview

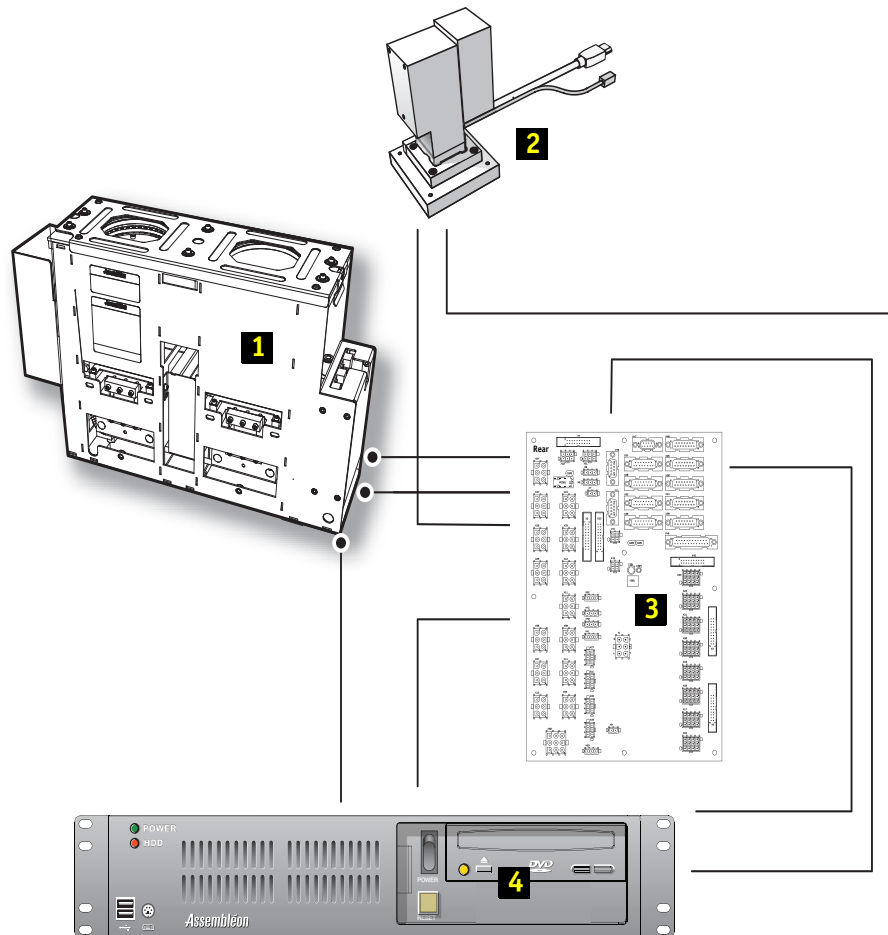


Figure 4 Vision system

1. CV (component vision) camera
2. BA (board alignment) camera
3. Interconnection board base
4. System controller

The CV camera is used for, alignment and checking of components. The alignment function of the CV camera is to measure the orientation of the component on the placement head with respect to the head that picked it. The orientation data is used to calculate the target position, where the placement head is lowered for placement. Since the placement head position is related to the machine by the CV camera and the board position is related by the BA camera, an accurate component to board target position is calculated.

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F4.2 Component vision

F4.2.1 Alignment procedure

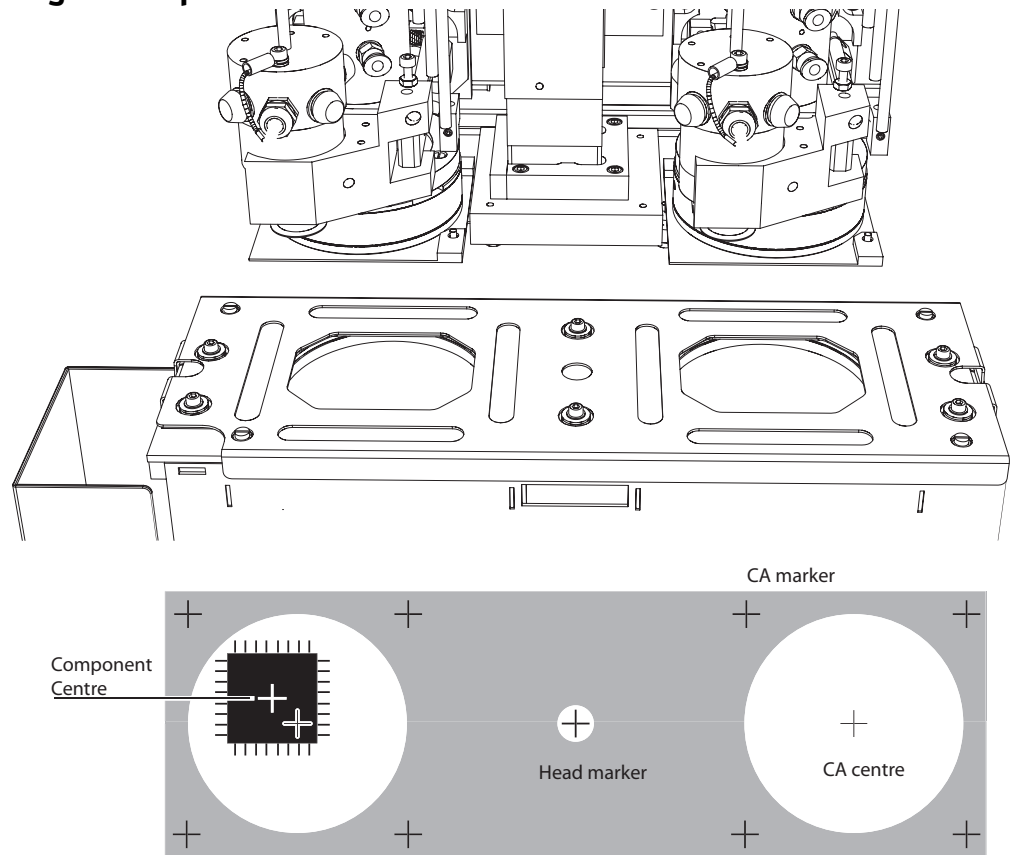


Figure 5 Alignment overview

Component vision is done by exposure of the picked component within the field of view of the CV camera. In the meantime the BA camera measures the head marker. The CV camera can determine the position of the component with respect to four markers on the glass plate, which have a defined position to the head marker. The results of measuring the component, CV markers and head marker is to improve the placement accuracy of the component.

Components are measured as follows:

1. The BA camera measures the head marker to define the exact location of the CV camera.
2. The picked component is moved within the field of view of the CV camera.
3. The CV camera takes a picture of the component and the four CV markers on the glass plate.
4. The software calculates the exact offset and takes this offset in account for a correct placement of the component on the board.

F4.2.1.1 Glass plate in CV camera

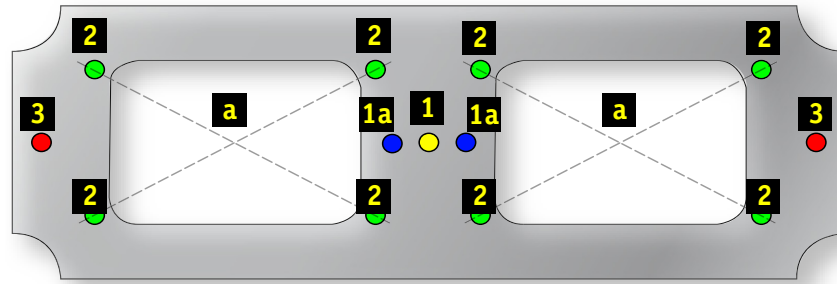


Figure 6 Glass plate

1. Head marker
Position of this marker is measured by the BA camera, simultaneously with the component measurement.
- 1a. Head markers for placement heads dual vision configuration.
2. CV markers
Position of these markers are measured by the CV camera, when starting production and every 20 minutes.
The marker positions result in an imaginary intersecting line (a).
3. Position markers (temperature compensation).
Position of these markers are measured by the BA camera, when starting production and every 20 minutes.
This to eliminate temperature influences.

F4.3 CV camera, parts

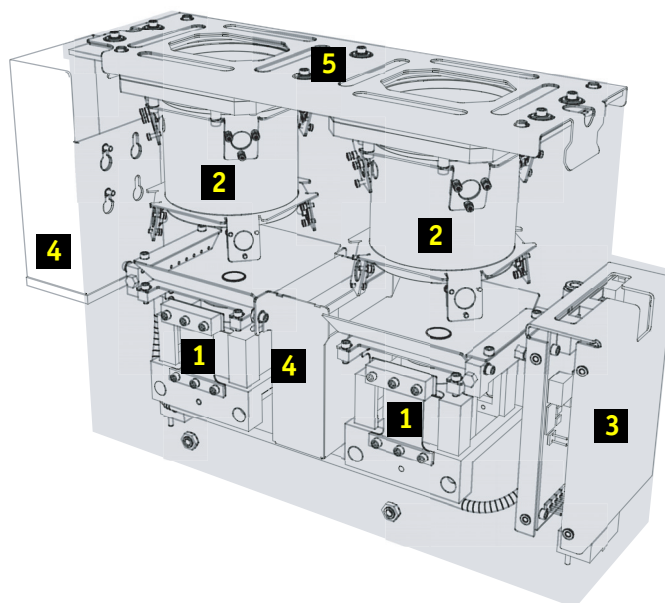


Figure 7 CV camera, parts

1. Large field of view (LFOV), small field of view (SFOV) camera illumination units, see [F4.3.1](#)
2. Illumination control unit, see [F4.3.1.1](#)
3. Dump bins.
4. Glass plate with markers, see [F4.2.1.1](#)

F4.3.1 CV camera with illumination unit

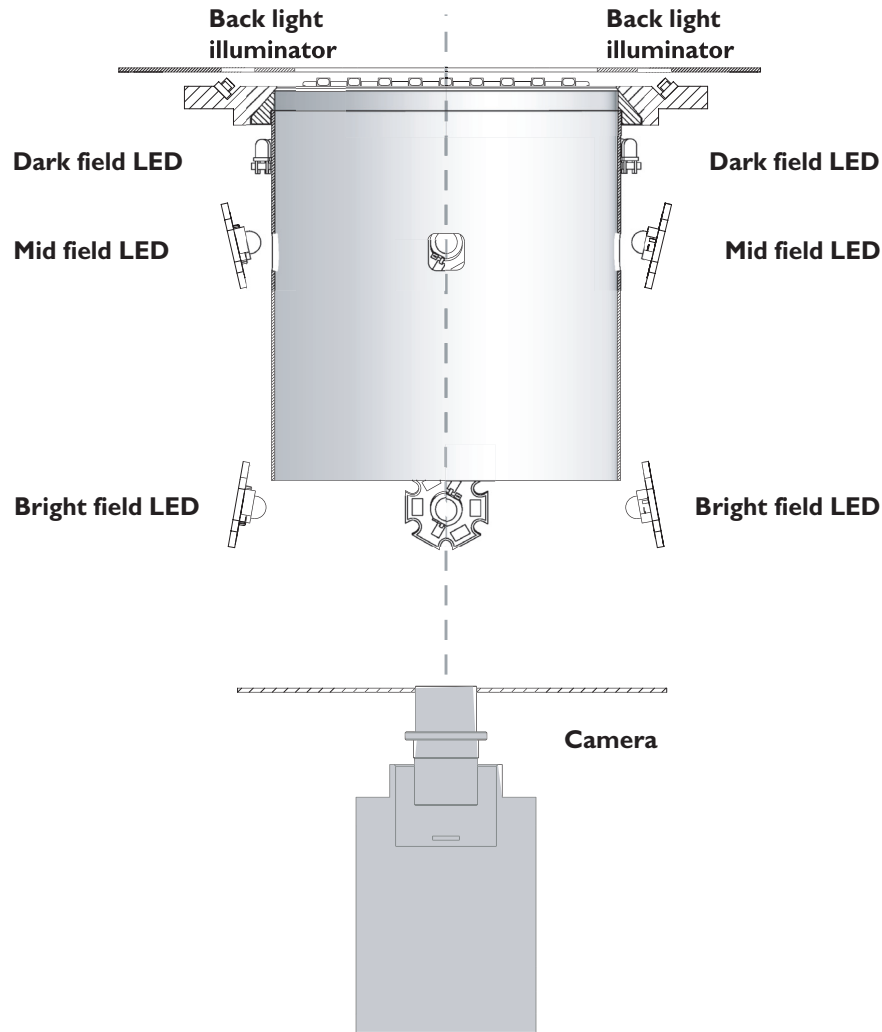


Figure 8 CV camera with illumination unit

Dark field of view is used for bumped components. This beam of light creates a reflection and makes the bumps visible for the camera.

Bright field of view is used for leaded components. This beam of light creates a reflection on the leads and makes the leads visible for the camera.

Mid field of view is used to create the correct balance between dark field and mid field or bright field and mid field.

Back light is used for odd components.

F4.3.1.1 CV camera, illumination control unit

The function of the illumination control unit is:

- to control the (small field of view (SVOF)/large field of view (LFOV)) camera's
- to control the illumination units and deliver the current for the illuminations LEDs
- to store calibration data
- support maintenance and service functions (number of flashes, sense the availability of power supplies, temperature measurement).

The illumination control unit is interfaced to the machine controller via Firewire.

Trigger and 24V is supplied via the interconnection board base.

F4.4 Board alignment

F4.4.1 BA camera

The BA cameras (Figure 9) are mounted on the X carriage.

The camera is mounted face-down and provides a digital picture via the firewire to the system controller. This picture can be processed to perform board alignment, artwork recognition or bad mark sensing. The BA camera is equipped with two (2) light sources: bright field and dark field.

It improves the placement accuracy of the component with respect to the board by measuring fiducials.

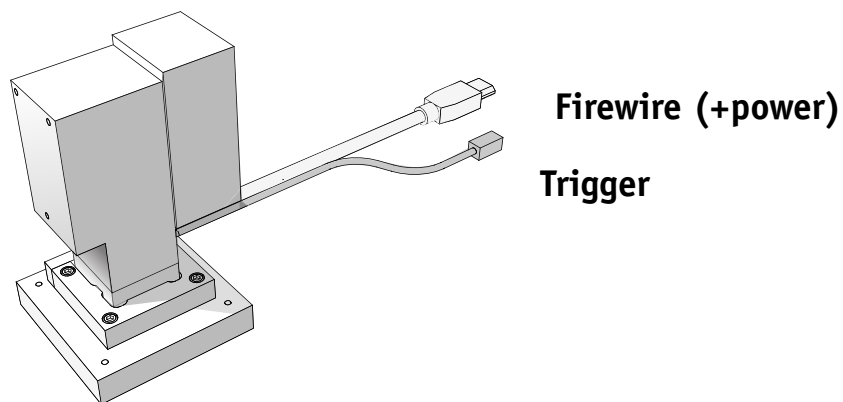


Figure 9 BA camera

CHAPTER F5 Trouble shooting

F5.1 Troubleshooting work flow

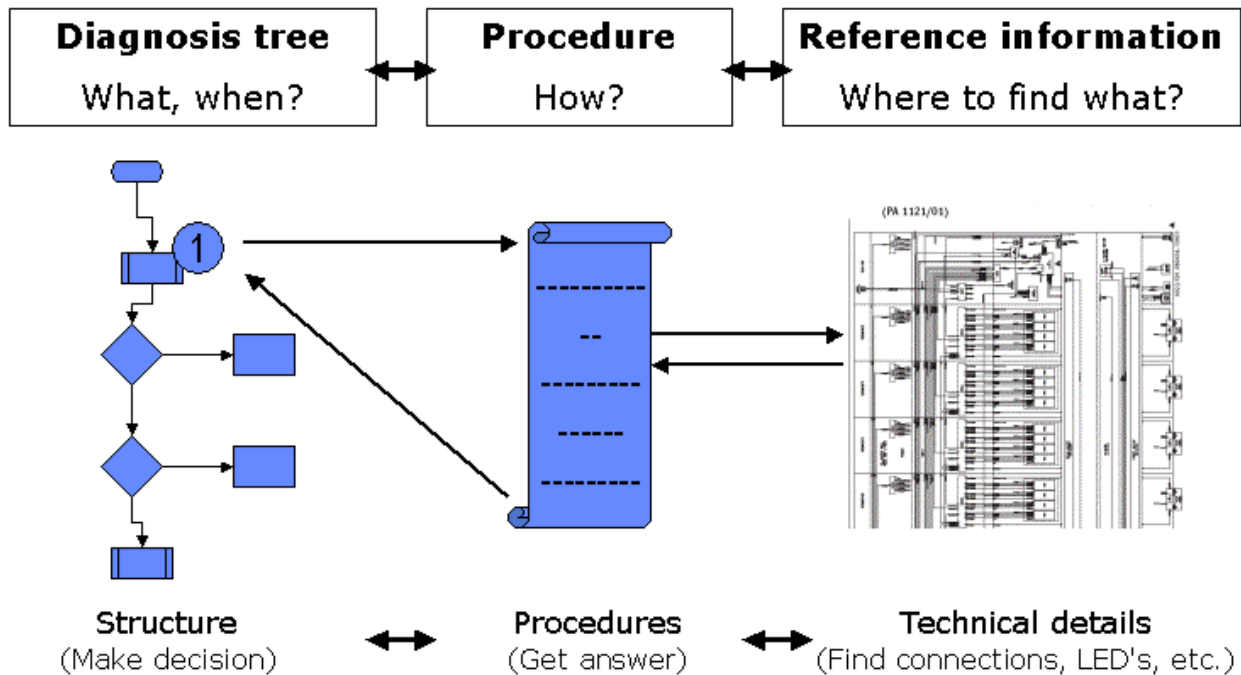


Figure 10 Visual structure of chapter 5

This chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.

The diagnosis trees, diagnosis procedures and reference information are separate paragraphs in the manual. The links between these paragraphs are in one direction in the text.

Using this manual on-line will link the paragraphs in two directions using the 'back' button in the browser.

F5.2 Diagnosis trees and tables

F5.2.1 Diagnosis trees, conventions

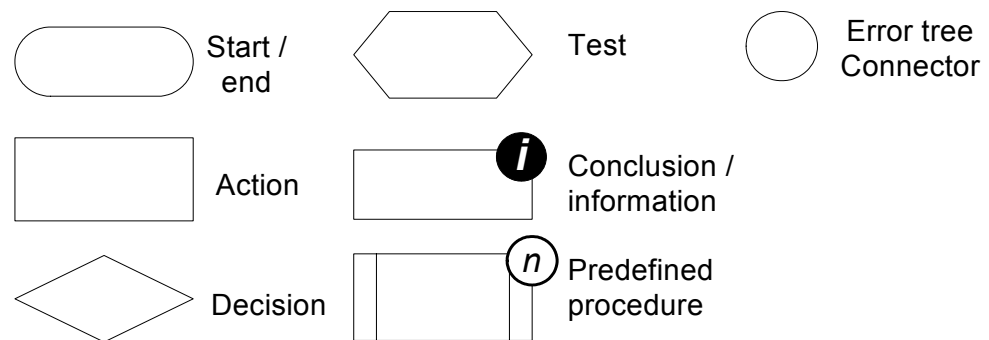
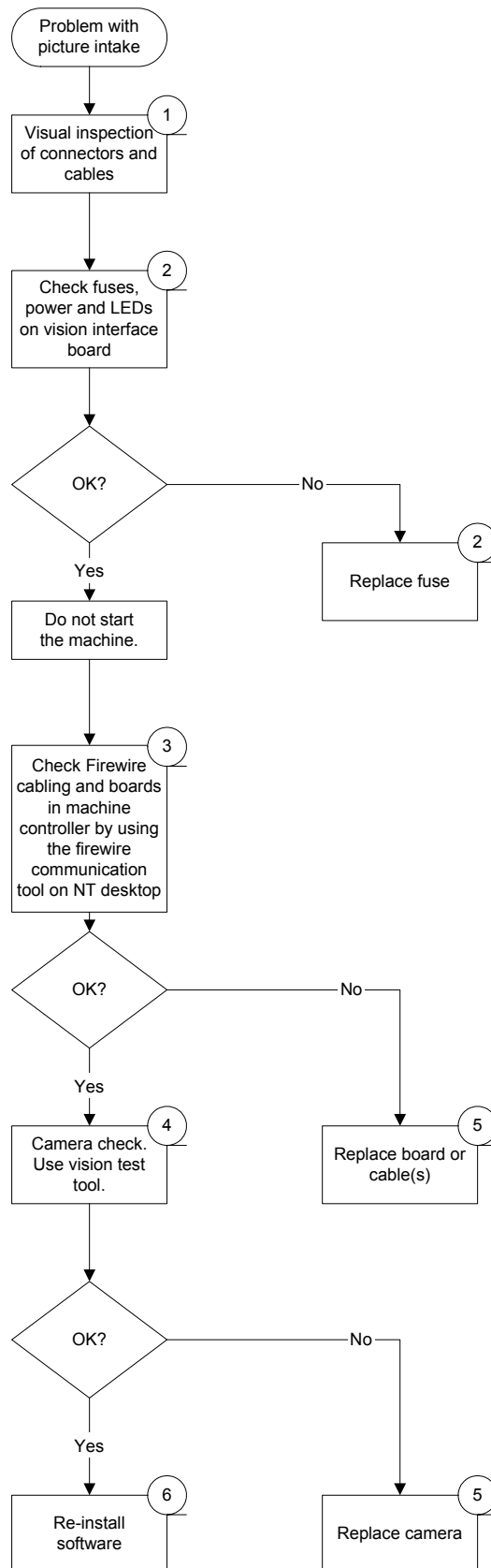


Figure 11 Error trees, conventions

F5.2.2 Picture intake problem



Reference:

1. F5.4 Diagrams
2. B5.3.11 Interconnection board base, fuses and LED signalling
3. A5.1.7 Vision hardware test tool
4. A5.1.7 Vision hardware test tool
5. B8.19 Interconnection board base, replacement
6. B8.3 Operating software, installation

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Figure 12 Picture intake problem

F5.3 Reference information

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F5.4 Diagrams

F5.4.1 Vision diagram

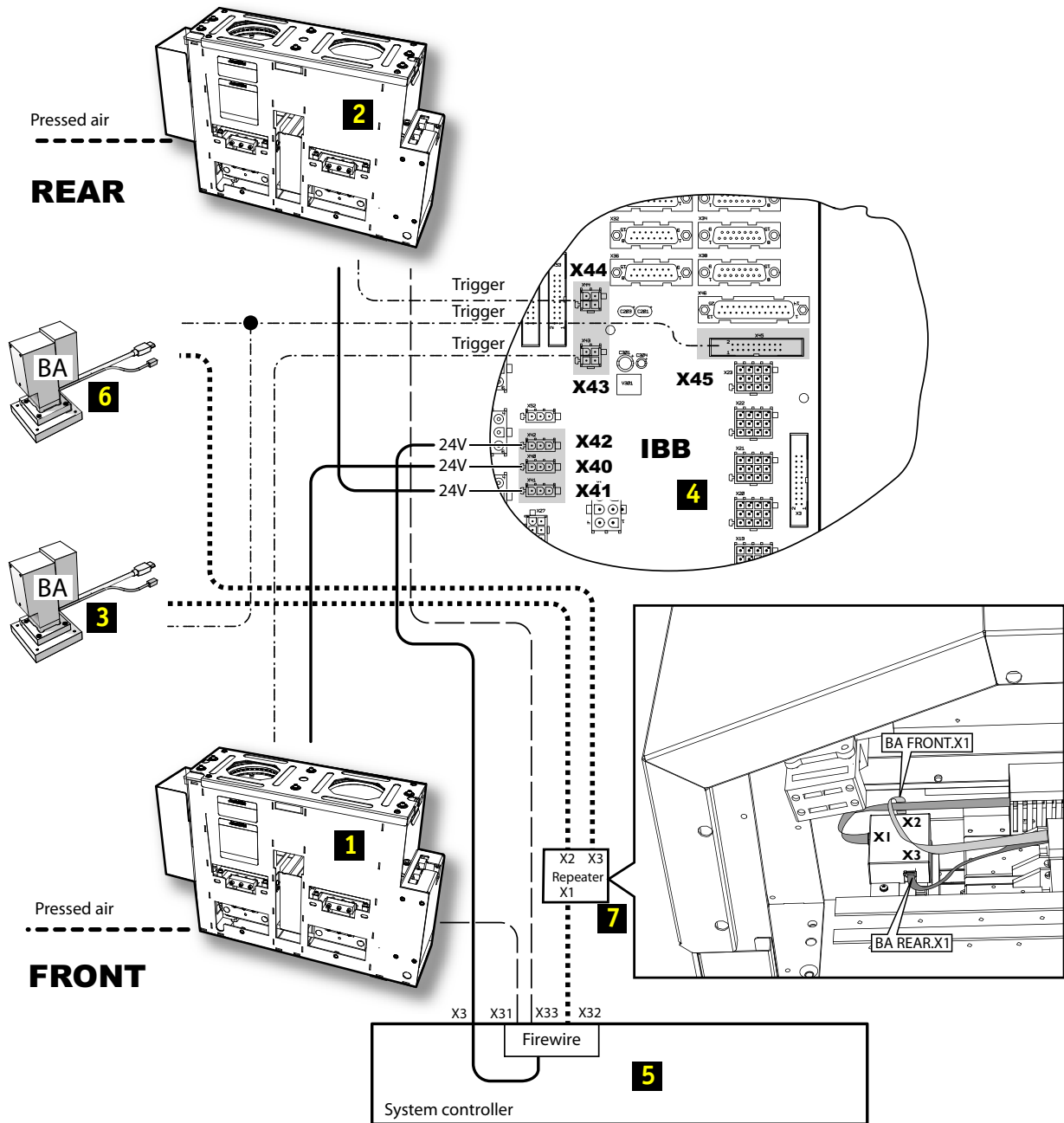


Figure 13 Vision diagram

1. CV camera, front
2. CV camera, rear
3. BA camera, front
4. Interconnection board base (IBB)
5. System controller
6. BA camera, rear
7. Repeater.

CHAPTER F6 Measurement, adjustment and calibration



NOTE: Adjustments, maintenance and repair of this equipment should only be carried out by qualified personnel. More detailed repairs not included in this manual should be carried out by the Assembléon Service Centre

CHAPTER F7 Maintenance instructions



NOTE: Operation, adjustment, maintenance and repair of this machine shall be carried out by **qualified and trained** personnel only.

This chapter contains detailed (corrective and preventive) maintenance instructions.

The preventive maintenance intervals are defined in [A7.3 Preventive maintenance schedule](#) .

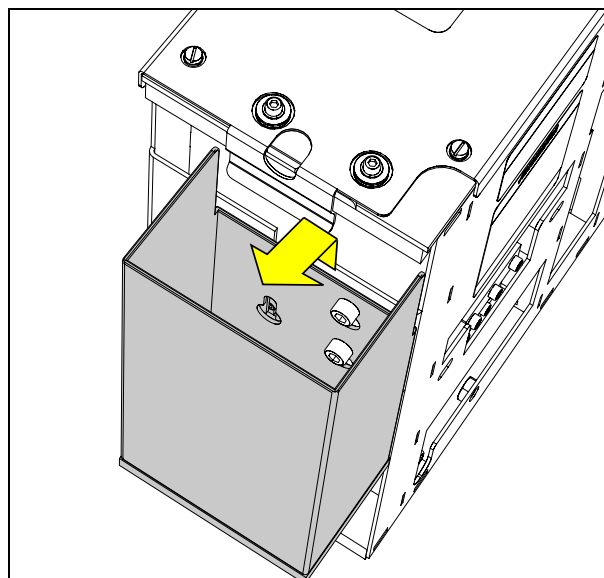
For Material Safety Data Sheets, see [A2.12 Material safety data sheets \(MSDS\)](#)

F7.1 CV camera, cleaning the external waste bin

Estimated time to complete [min.]: 2
Required special tools. Vacuum cleaner
Required part(s) -

1. Cleaning the external waste bin

- Use a vacuum cleaner or empty the external waste bin.
- Remove waste bin by lifting it and move it sideways.



F7-00003.fm

F7.2 Vision markers on CV camera, cleaning

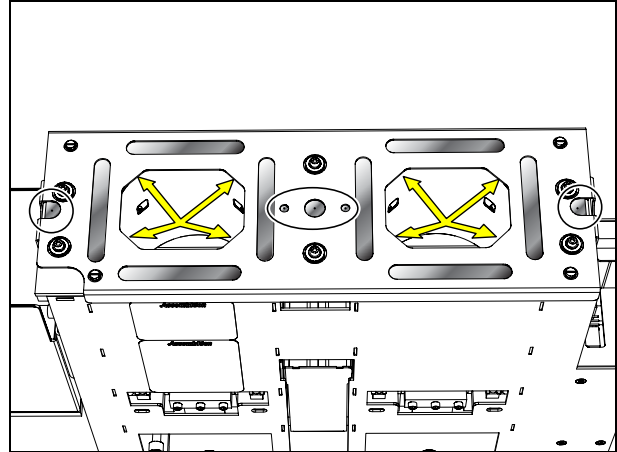
Estimated time to complete [min.]: 5
 Required special tools. Ethanol, fibre free tissues
 Required part(s) -

1. Prerequisites

- Remove trolley.

2. Clean the markers

- Use a fibre free tissue and ethanol.



F7.3 BA camera, cleaning

Estimated time to complete [min.]: 2
Required special tools. Clean air spray, lens tissue
Required part(s)



IRRITATING SUBSTANCE

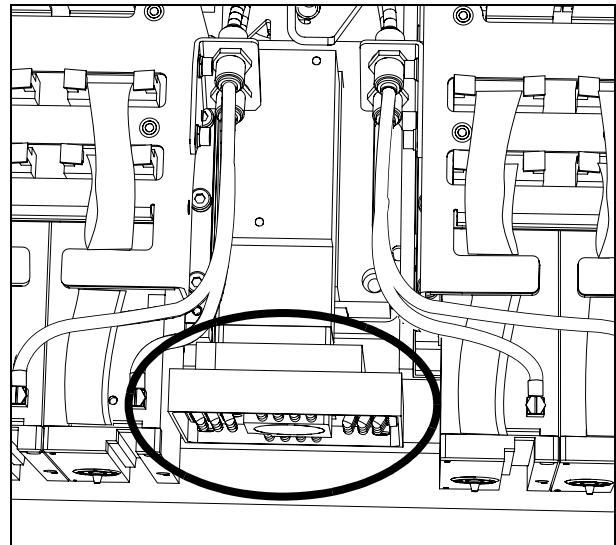
Direct contact may cause irritation of the skin.
Avoid direct contact. Use Personal Protection Equipment.

1. Prerequisites

- Power down the machine.

2. Cleaning the lens of the BA camera

- Remove dust from the board alignment lens using a clean air spray and lens cleaning tissue.
- Clean the LEDs with fibre free tissues.



F7-00002.fm

F7.4 CV camera, cleaning the glass plate

Estimated time to complete [min.]: 15

Required special tools. Fibre free tissue, ethanol, small soft brush

Required part(s) -



IRRITATING SUBSTANCE

Direct contact may cause irritation of the skin.

Avoid direct contact. Use Personal Protection Equipment.

1. Prerequisites

- Stop production.
- Remove the trolley on section 2.
- If necessary, remove the metal cover very carefully.

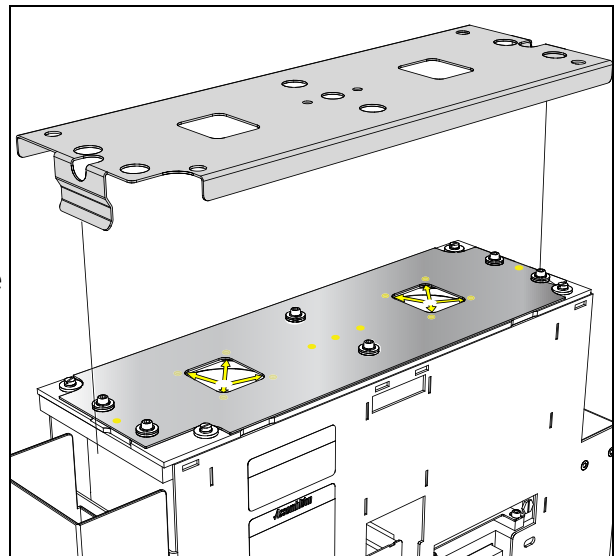
2. Cleaning the CV camera(s)

- Clean the glass plate using a fibre free tissue with ethanol.
Use a soft brush to clean the CV markers underneath.
- Clean the glass plate again with a fibre free tissue but now without the ethanol.
- Clean the rear camera glass plate the same as the front camera.
- Clean the 4 corner markers of the CV camera (8 per glass plate) from the inner side with a very small brush using fibre free tissue and ethanol.

Note: Do NOT remove the glass plate during this cleaning action.

3. Finalize

- Place the trolley back, close the hood and continue production.



F7.5 CV camera, cleaning the internal waste bin

Estimated time to complete [min.]: 2 or 20

Required special tools. -

Required part(s) -

1. Prerequisites

- Remove the trolley in front of the CA camera.
- Type A only: Remove the four bolts (1) and take off the trolley guide in front of the CV camera.

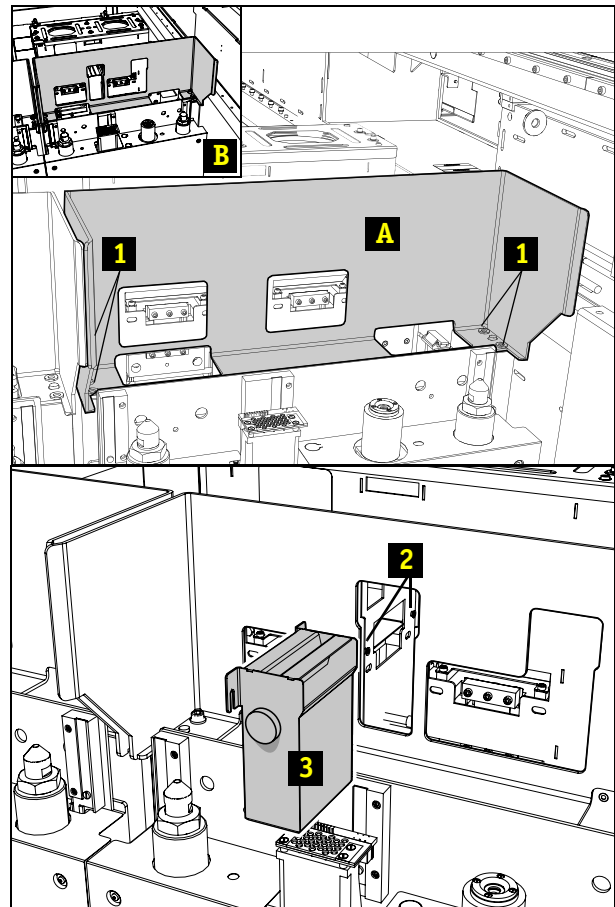
Note: If desired, trolley guide type A can be replaced by type B.

2. Empty the waste bin

- Loosen the mounting bolts (2).
- Take the dump bin (3) out and empty it.

3. Finalize

- Install the dump bin (3).
- When removed, install the trolley guide (four bolts) in front of the CV camera.



CHAPTER F8 Installation and replacement instructions

F8.1 Replacement instructions

Only those parts that require special procedures will be detailed in this section.

F8-00001.fm

F8.1.1 BA camera, replacement

Estimated time to complete [min.]: 15
Required special tools. -
Required part(s) [A8.4.13 Vision, spares](#)

1. Prerequisites

- Power down the machine.

Note: Remember where the tie wraps are located.

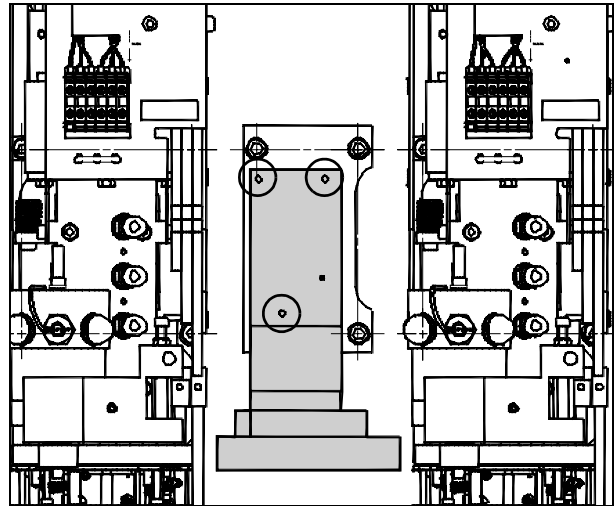
2. Replacing the BA camera

Note: Avoid working above the CV camera. Preferably shift the X-beam to the mechanical Y end stop before replacing the BA camera.

- Disconnect the connectors.
- Use a 2.5 mm Allen key to loosen the 3 BA camera bolts and take the BA camera off carefully.

Note: When the BA camera is located between placement head DV: Remove the bracket that blocks the bolts.

- Assemble the BA camera in the reverse order of removal, torque screws to 1.5 Nm crosswise. Apply Molykote DX paste on the thread.
- Mount new tie wraps where removed before.



3. Finalize

- Perform an exchange calibration of the BA camera, see [A6.1.1 Exchange calibration procedure](#).

F8.1.2 CV camera, replacement

Estimated time to complete [min.]: -
Required special tools. -
Required part(s) -



DANGER, HIGH VOLTAGE

Contact may cause electric shock or burn.

Turn off and lock out machine before servicing, see Safety chapter.

1. Prerequisites

- Remove the trolley(s).
- Shut down the machine and set main power switch to 'OFF';
- Switch off power at the factory switch.
- Lock the main switch by a padlock to avoid unauthorized use.

2. Removal

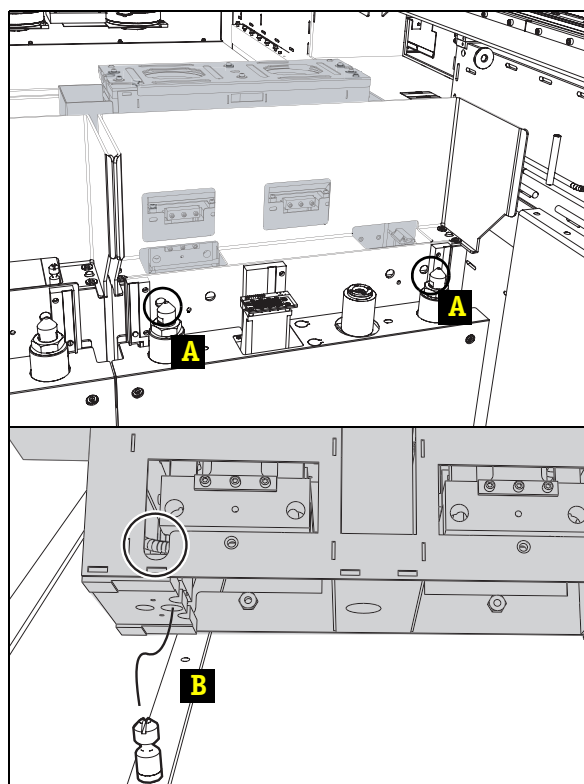
- Loosen 2 CV camera fixing bolts (A);
- Disconnect the connectors.
- Disconnect air hose.
- Tilt CV camera from location dowels (B).

3. Assembly

- Installing of the CV camera is in reverse order of removal.

4. Finalize

- Perform an exchange calibration of the CV camera, see [A6.1.1 Exchange calibration procedure](#)



F8.1.3 Repeater, replacement

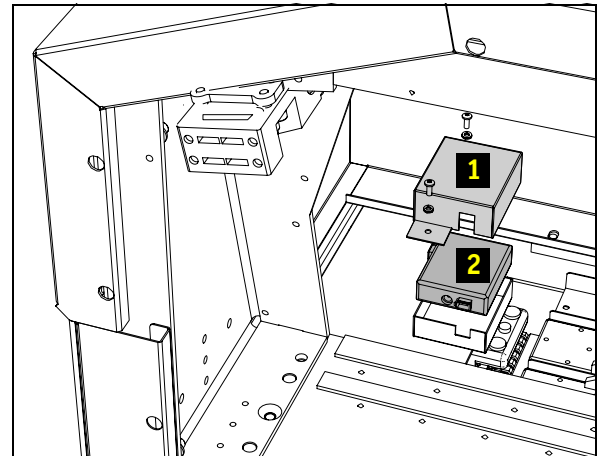
Estimated time to complete [min.]: -
Required special tools. -
Required part(s) -

1. Prerequisites

- Remove the trolley(s) rear.
- Shut down the machine.

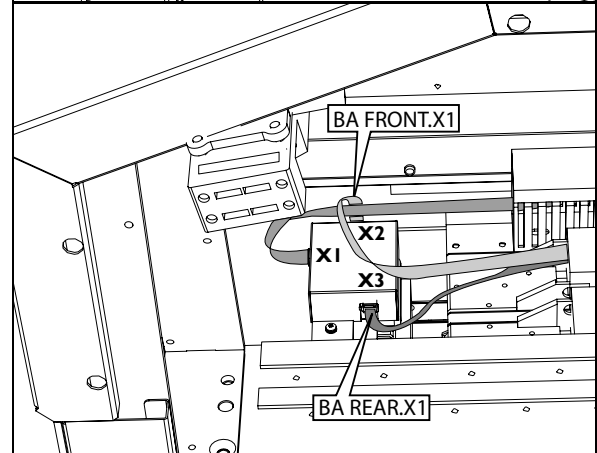
2. Replace repeater

- Disconnect the connectors from repeater.
- Remove cover (1).
- Replace repeater (2).
- Mount cover (1).



3. Connect repeater

- Connect repeater according picture.



F8-00005.fm

G. XY-ROBOT

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CHAPTER G1 Introduction

The XY robot contains two Y-axes (Y1 at the left, Y2 at the right) and one X-axis, all with linear motors and linear encoders. Each axis has its own controller and power stage, all located inside the control supply. These controllers are interfaced through a Synqnet network.

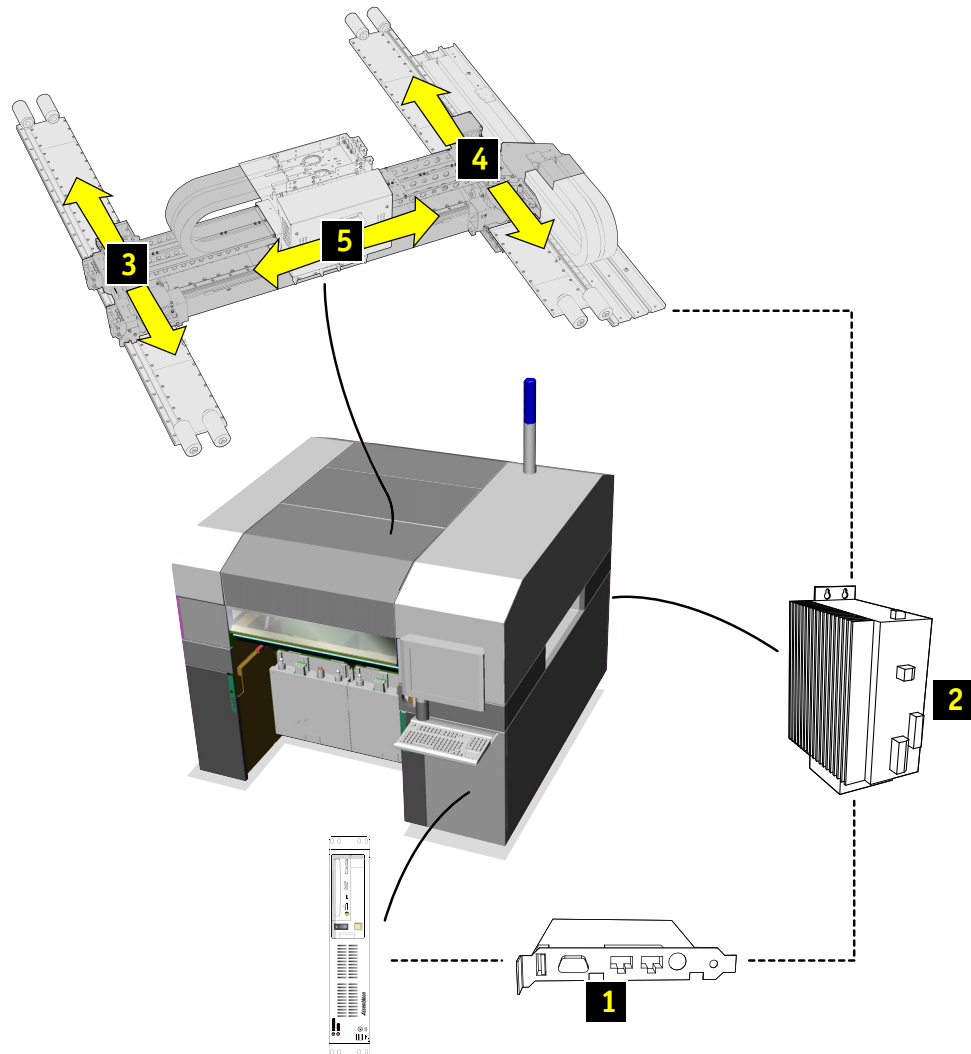


Figure 1 XY robot parts

1. XY controller in process controller
2. Motion amplifiers X, Y1 and Y2
3. Y1 motor
4. Y2 motor
5. X motor.

G1-00001.fm

CHAPTER G2 Safety and ergonomics

The base is part of the whole machine.

Safety and ergonomics is only described for the machine as a whole.

See [CHAPTER A2 Safety](#) .

CHAPTER G3 Technical specifications

G3.1 Identification

G3.1.1 XY robot, identification

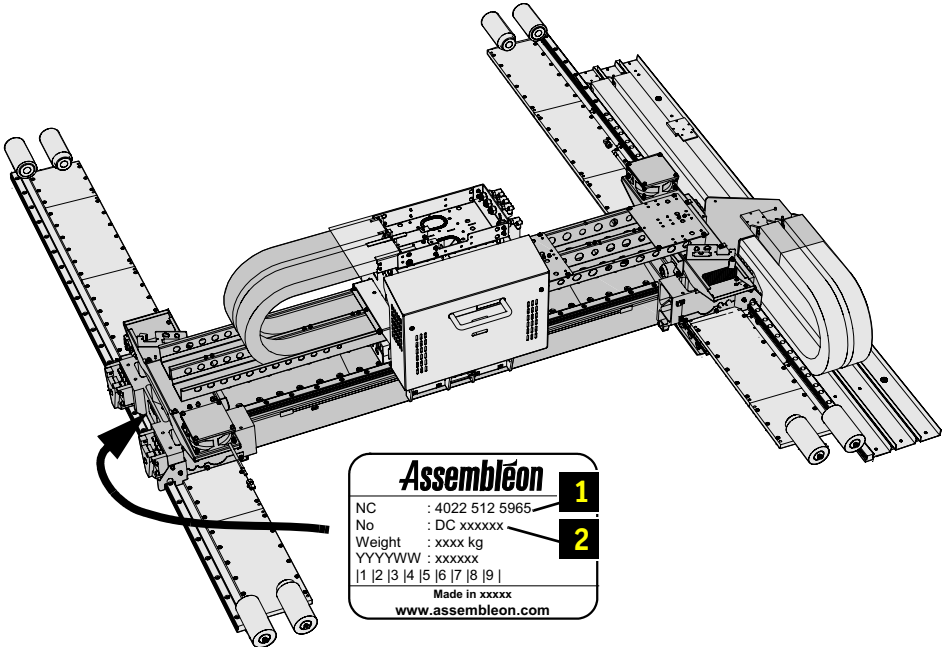


Figure 2 XY robot, identification

Use a mirror for identification.

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Serial number	6 digit DC-number.

Figure 3 XY robot, identification

CHAPTER G4 Functional description

Components are transported from the feeding sections to the place where they are placed on the board. Horizontal movement (X and Y direction) is done by the XY robot.

G4.1 XY robot, overview

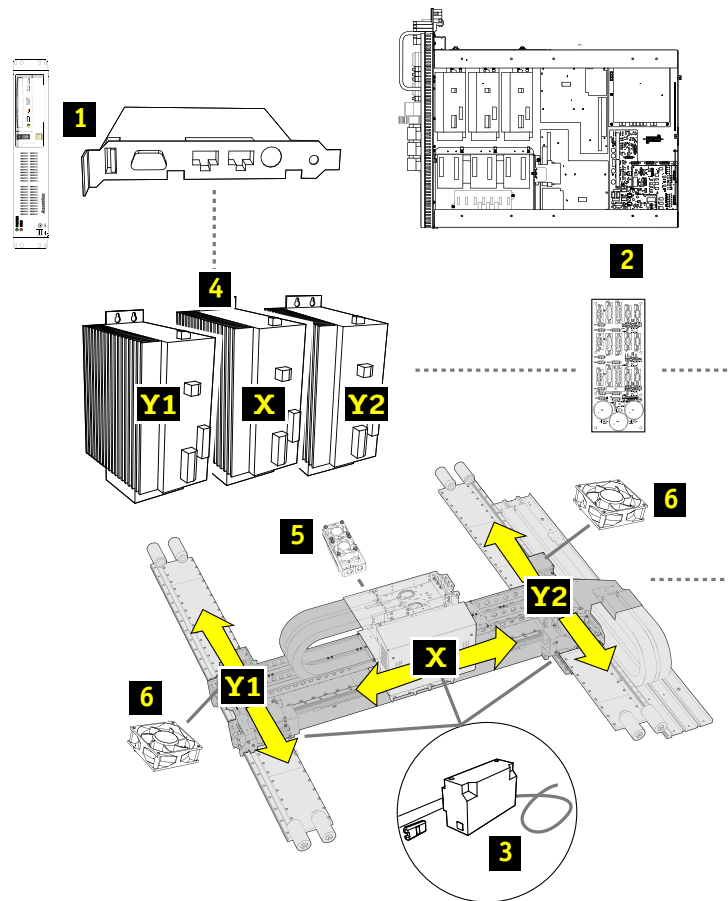


Figure 4 XY robot

Parts overview:

1. XY controller in process controller
2. Interconnection board drives in control supply
3. Encoders
4. Motion amplifiers Y1,X,Y2
5. Fan X
6. Fan Y1, Y2

The XY robot contains two Y-axes (Y1 at the left, Y2 at the right) and one X-axis, all with linear motors and linear encoders. Each axis has its own controller and power stage, all located inside the electronics cabinet. These controllers are interfaced through a Synqnet network.

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CHAPTER G5 Troubleshooting

G5.1 Troubleshooting workflow

The troubleshoot chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.



NOTE: Using the electronic version of the manual will enable the user to use hyperlinks and the 'back' button in the browser to navigate quickly through the information in separate paragraphs.

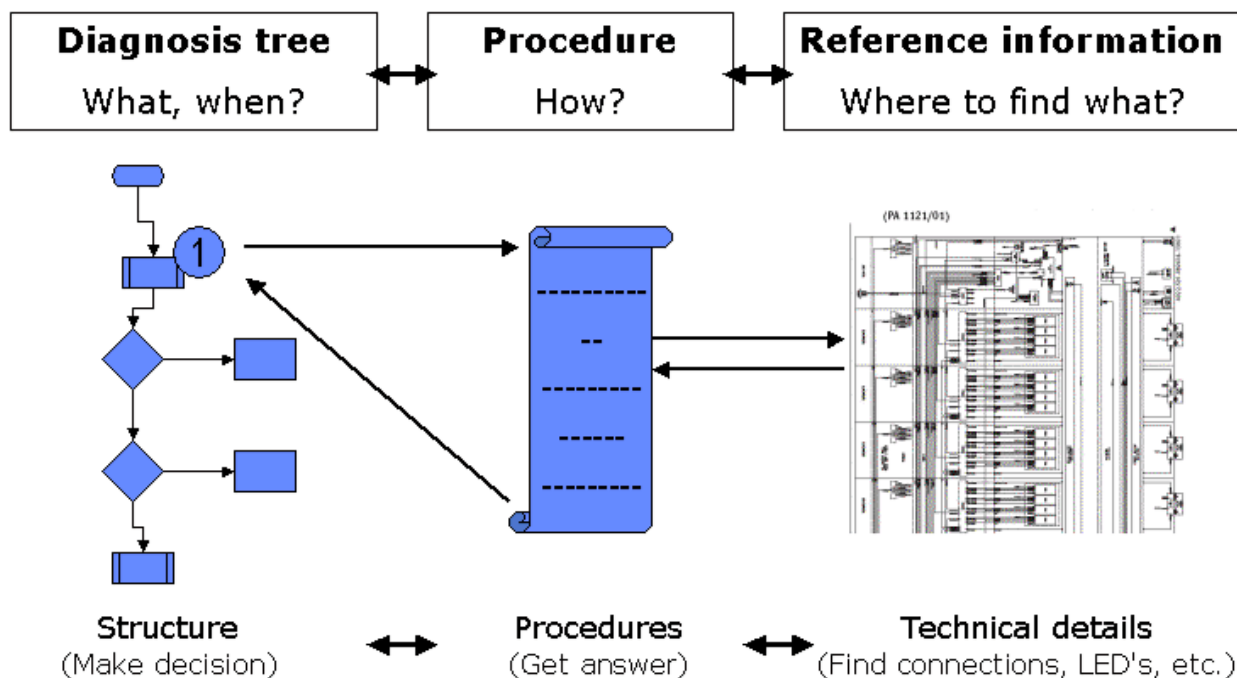


Figure 5 Visual structure of chapter 5

G5.2 Diagnosis trees and tables

G5.2.1 Diagnosis trees, conventions

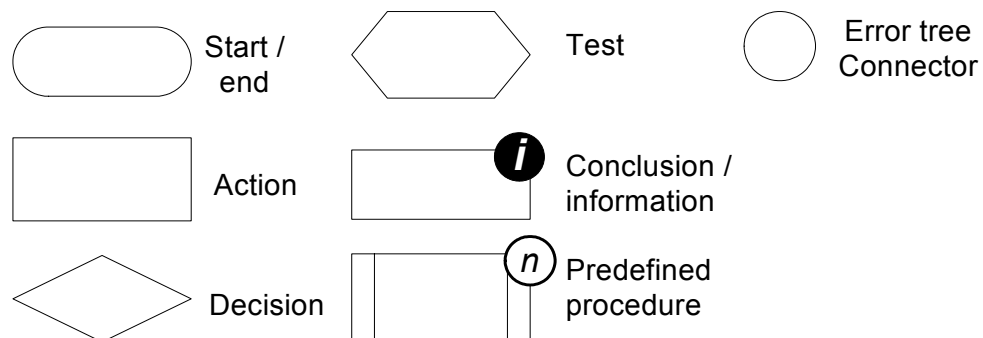
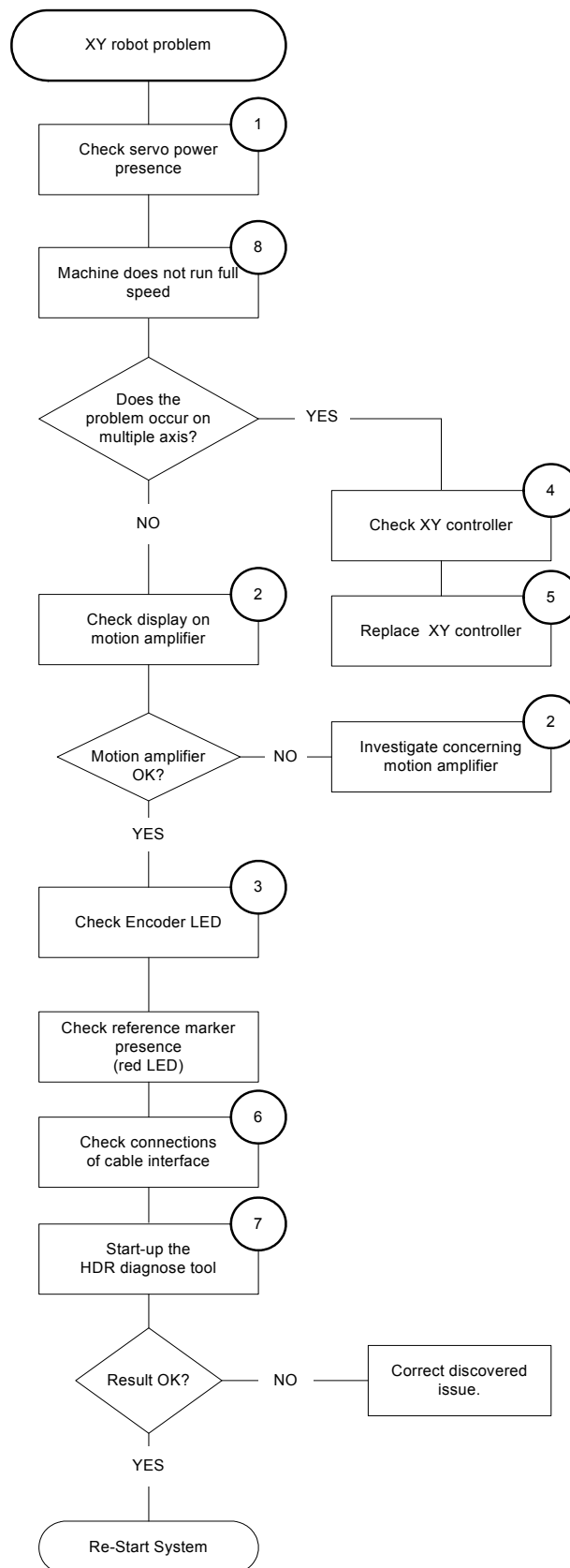


Figure 6 Error trees, conventions

G5.2.2 XY robot, diagnosis tree



Reference:

- 1.G5.2.2.1 Check servo power presence
- 2.G5.3.4 Motion amplifier, connections
- 3.G5.3.6 Encoders on XY robot, LED signalling
- 4.G5.3.1 XY controller, settings
- 5.G8.1 XY controller, replacement
- 6.G5.4.1 XY robot, wiring diagram
- 7.A5.1.3 TIP tools
- 8.G5.2.2.2 Machine does not run at full speed

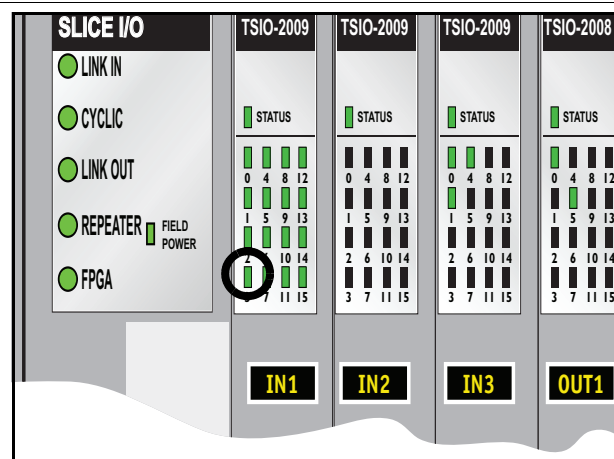
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Figure 7 XY robot, diagnosis tree

G5.2.2.1 Check servo power presence

1. Check LED on digital IO

- Check if LED IN1-3 is ON.
- If LED is off, see [B5.2.2 Mains power supply, diagnosis tree](#)



G5.2.2.2 Machine does not run at full speed

1. Check cooling of XY robot

Specified ambient operating temperature is 20°C to 28°C.

The XY robot speed can be reduced due to over temperature in the motors. This can be caused by filthy fans.

- Clean the fans, see
 - * [G7.3 Fans on X axis, cleaning](#)
 - * [G7.4 Fans on Y axis, cleaning](#)

G5.3 Reference information

G5.3.1 XY controller, settings

Location of XY controller, see [B5.3.6 Process controller, slots](#)

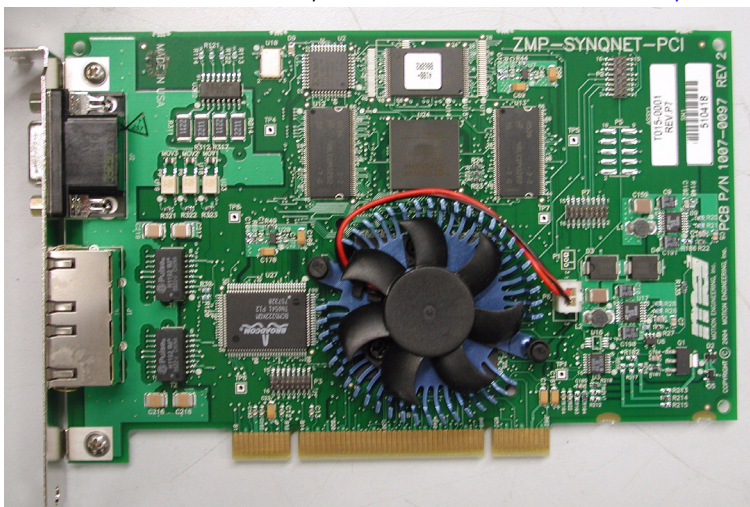


Figure 8 XY controller

No setting applicable.

G5.3.2 Interconnection board drives (IBD), connections

This part is mounted in the control supply, see [B5.3.1 Control supply, lay-out](#)

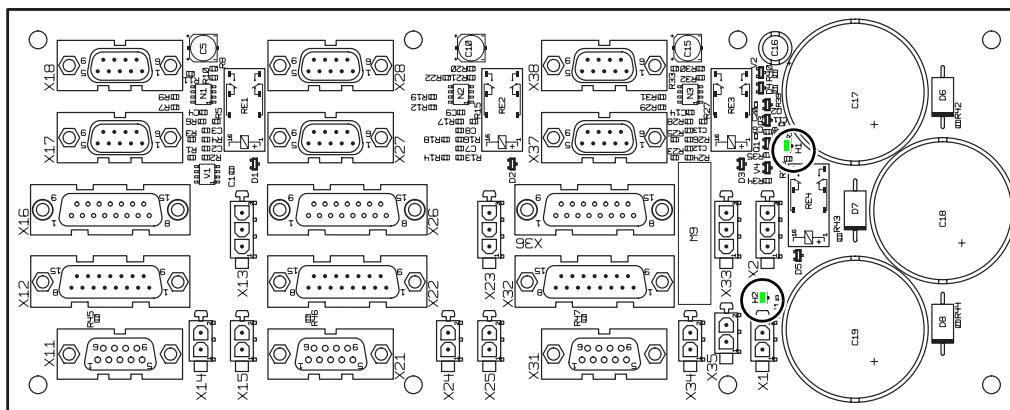


Figure 9 Interconnection board drives (IBD)

Connector			Description
X1			24V IN
X2			E-stop IN
X	Y1	Y2	
X11	X21	X31	External I/O from motion amplifier, servo
X12	X22	X32	C2 from motion amplifier (encoder in) servo
X13	X23	X33	C3 from motion amplifier (Enable)
X14	X24	X34	Logic supply from motion amplifier, servo
X15	X25	X35	Fan
X16	X26	X36	Encoder
X17	X27	X37	Motor PTC
X18	X28	X38	External PTC
LED signalling			Description
H1			Enabling circuit
H2			Power supply

Figure 10 Interconnection board drives (IBD)

G5.3.3 Interconnection board drives (IBD), signals

This part is mounted in the control supply, see [B5.3.1 Control supply, lay-out](#)

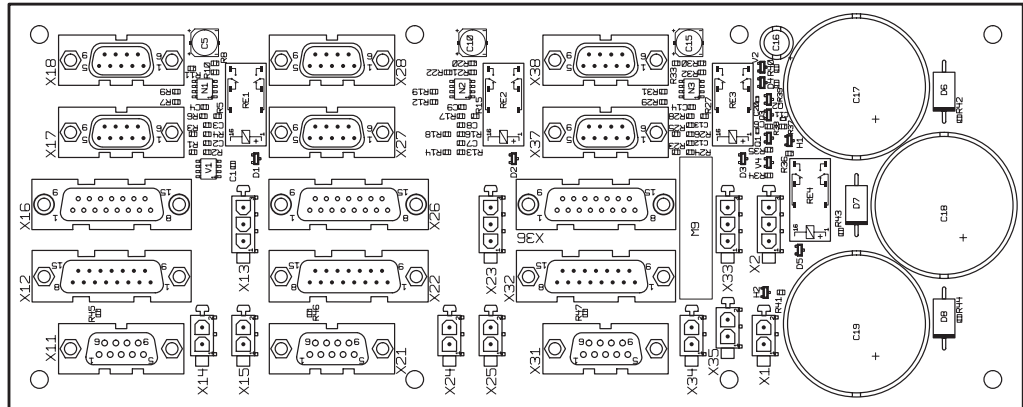


Figure 11 Interconnection board drives (IBD)

Pin	Description	Netname	Description	Netname	Description	Netname
	X1 Supply in		X2, E-stop IN			
1	24V	24V	N.C.	N.C.		
2	0V	0V	0V	0V		
3	-	-	E-stop	E-stop		
	X11, External I/O drive X		X21, External I/O drive Y1		X31, External I/O drive Y2	
1	Analog IN+	TEMP-X	Analog IN+	TEMP-Y1	Analog IN+	TEMP-Y2
2	AGND	0V	AGND	0V	AGND	0V
3	Analog IN-	0V	Analog IN-	0V	Analog IN-	0V
4	Common OUT2/OUT3	0V	Common OUT2/OUT3	0V	Common OUT2/OUT3	0V
5	OUT2	RELAY-X	OUT2	RELAY-Y1	OUT2	RELAY-Y2
6	IN4	Alarm-X	IN4	Alarm-Y1	IN4	Alarm-Y2
7	common IN4 to IN7	0V	common IN4 to IN7	0V	common IN4 to IN7	0V
8	OUT3.	FANS	N.C.	N.C.	N.C.	N.C.
9	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
	X12, Encoder Drive X (to C2)		X22, Encoder Drive Y1 (to C2)		X32, Encoder Drive Y2 (to C2)	
1	5V encoder	5V-X	5V encoder	5V-Y1	5V encoder	5V-Y2
2	GND encoder	GND-X	GND encoder	GND-Y1	GND encoder	GND-Y2
3	A	ENCA-X	A	ENCA-Y1	A	ENCA-Y2
4	/A	ENC/A-X	/A	ENC/A-Y1	/A	ENC/A-Y2
5	B	ENCB-X	B	ENCB-Y1	B	ENCB-Y2
6	/B	ENC/B-X	/B	ENC/B-Y1	/B	ENC/B-Y2
7	I	ENCI-X	I	ENCI-Y1	I	ENCI-Y2
8	/I	ENC/I-X	/I	ENC/I-Y1	/I	ENC/I-Y2
9	N.C	N.C.	N.C	N.C.	N.C	N.C.
10	N.C	N.C.	N.C	N.C.	N.C	N.C.
11	N.C	N.C.	N.C	N.C.	N.C	N.C.
12	N.C	N.C.	N.C	N.C.	N.C	N.C.
13	N.C	N.C.	N.C	N.C.	N.C	N.C.
14	thermostat High	PTC1-X	thermostat High	PTC1-Y1	thermostat High	PTC1-Y2
15	thermostat Low	PTC2-X	thermostat Low	PTC2-Y1	thermostat Low	PTC2-Y2
	X13, Enable X (to C3)		X23, Enable Y1 (to C3)		X33, Enable Y2 (to C3)	
1	Enable	Enable	Enable	Enable	Enable	Enable
2	0V	0V	0V	0V	0V	0V
3	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
	X14 Logic supply servo drive X		X24 Logic supply servo drive Y1		X34 Logic supply servo drive Y2	
1	24V	24V-X	24V	24V-Y1	24V	24V-Y2
2	0V	0V	0V	0V	0V	0V

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Pin	Description	Netname	Description	Netname	Description	Netname
X15 FAN X			X25 FAN Y1		X35 FAN Y2	
1	24V	24V-FANS	24V	24V-FANS	24V	24V-FANS
2	0V	0V	0V	0V	0V	0V
X16 Encoder X			X26 Encoder Y1		X36 Encoder Y2	
1	5V encoder	5V-X	5V encoder	5V-Y1	5V encoder	5V-Y2
2	GND encoder	GND-X	GND encoder	GND-Y1	GND encoder	GND-Y2
3	A	ENCA-X	A	ENCA-Y1	A	ENCA-Y2
4	/A	ENC/A-X	/A	ENC/A-Y1	/A	ENC/A-Y2
5	B	ENCB-X	B	ENCB-Y1	B	ENCB-Y2
6	/B	ENC/B-X	/B	ENC/B-Y1	/B	ENC/B-Y2
7	I	ENCI-X	I	ENCI-Y1	I	ENCI-Y2
8	/I	ENC/I-X	/I	ENC/I-Y1	/I	ENC/I-Y2
9	Alarm encoder	Alarm-X	Alarm encoder	Alarm-Y1	Alarm encoder	Alarm-Y2
10	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
11	0V Fan	0V	0V Fan	0V	0V Fan	0V
12	24V Fan	24V-FANS	24V Fan	24V-FANS	24V Fan	24V-FANS
13	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
14	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
15	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
X17 Motor PTC's X			X27 Motor PTC's Y1		X37 Motor PTC's Y2	
1	PTC1-X	PTC1-X	PTC1-Y1	PTC1-Y1	PTC1-Y2	PTC1-Y2
2	PTC2-X	PTC2-X	PTC2-Y1	PTC2-Y1	PTC2-Y2	PTC2-Y2
3	KTY1-X	KTY1-X	KTY1-Y1	KTY1-Y1	KTY1-Y2	KTY1-Y2
4	KTY2-X	0V	KTY2-Y1	0V	KTY2-Y2	0V
5	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
6	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
7	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
8	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
9	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
X18 External PTC X			X28 External PTC Y1		X38 External PTC Y2	
1	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
2	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
3	EXT-KTY1-X	EXT-KTY1-X	EXT-KTY1-Y1	EXT-KTY1-Y1	EXT-KTY1-Y2	EXT-KTY1-Y2
4	EXT-KTY2-X	0V	EXT-KTY2-Y1	0V	EXT-KTY2-Y2	0V
5	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
6	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
7	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
8	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.
9	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.

G5.3.4 Motion amplifier, connections

This part is mounted in the control supply, see [B5.3.1 Control supply, lay-out](#)

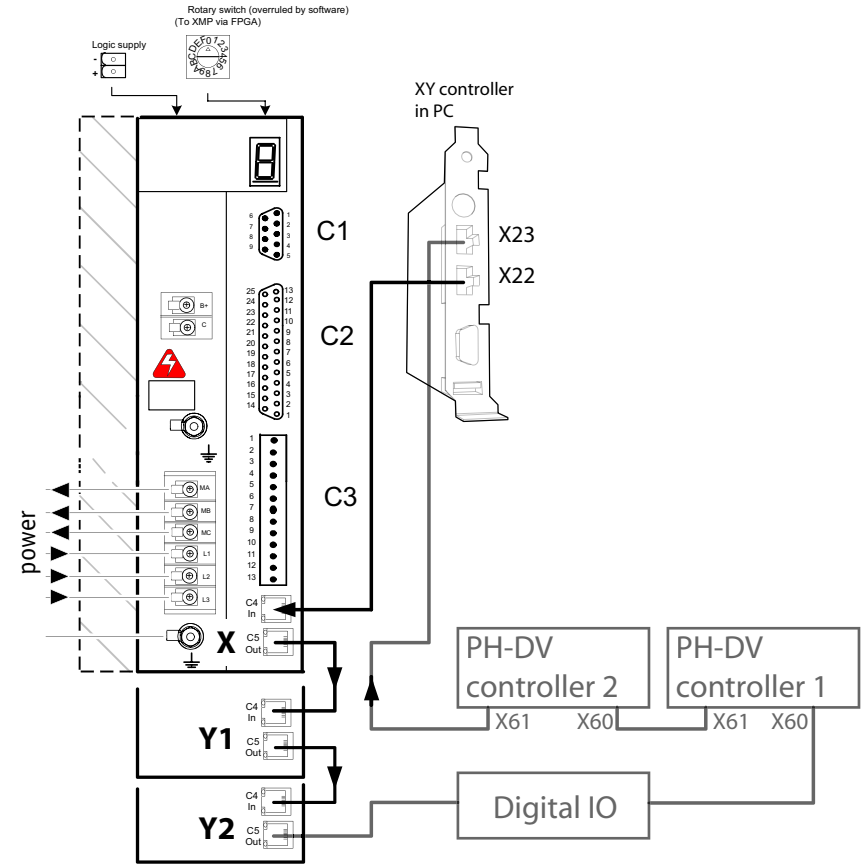


Figure 12 Motion amplifier, connections

Connections to motion amplifier, see [G5.4.1 XY robot, wiring diagram](#)

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G5.3.5 Motion amplifier, LED signalling






LED	Description	Priority	LED	Description	Priority
	After logic power is applied, the LED will show a decimal point only. The drive is not operational at that point. A SynqNet RESET needs to be executed in order to bring the drive to an operational state.			EEPROM fault is a hardware failure and the drive must be returned for repairs.	7
	Torque Mode: the drive is configured and ready to be enabled.		 Alternating	Internal-failure of positive analog supply voltage is a hardware failure and the drive must be returned for repair.	8
	The decimal point is on when the drive is enabled. The XY robot must be initialised once at first start.		 Alternating	Internal-failure of negative analog supply voltage is a hardware failure and the drive must be returned for repair.	9
 Flashing	This indicates that the drive is configured and ready to be enabled. The encoder initialization process will begin when the drive is enabled.		 Alternating	SynqNet communications fault. Check that the SynqNet cables are in place.	10
	Drive in Foldback (current limiting)		 Alternating	Encoder wire break 6	11
 Flashing	Flash memory checksum failure (at power up). Need to re-configure the drive's parameters and SAVE them in the flash memory.	1	 Alternating	Illegal Halls, a state of either 000 or 111 was detected on the Halls signals.	12
 Flashing	Over-current results from either a short circuit on the motor power, or by excessive current loop gain. This fault can only be cleared by cycling the power of the drive.	2	 Alternating	Index line break	13
 Flashing	Over-voltage generally caused by regenerative voltage when decelerating the motor. Use a regen resistor to absorb the regen energy.	3	 Alternating	The commutation initialization process has failed. Read the WNSERR value (parameter 0x2F) to see what caused the failure.	14
 Flashing	Drive over-temperature.	4	 Alternating	EnDat communications fault, check that the EnDat encoder is connected, or check the MENCTPYE parameter to verify that it is correctly set.	15
 Flashing	Under-voltage, this fault will appear when the main AC power is not connected. It may also appear during high accelerations. If this is the case, consider programming UVMODE to ride through temporary voltage sags, and UVRECOVER to determine how the drive recovers from an under-voltage fault. Servo power disabled.	5	 Alternating	A/B out of range for a sine encoder and a resolver, the drive checks that \sin^2 and $\cos^2 = 1$, within tolerance. This fault indicates that the signal amplitudes are out of tolerance. This fault is not relevant for Encoder feedback.	16
 Alternating	No comp; the drive is not configured. Load a configuration file and execute the CONFIG instruction.	6	 Flashing	Motor over-temperature – this fault may be triggered if the motor does not contain a temperature sensing device. If this is the case, set THERMODE to 1, which will tell the drive to ignore this fault.	17
	Watchdog: drive firmware failure.		 Alternating	Internal failure of positive and negative analog supply voltages.	

Figure 13

G5-00003.fm

G5.3.6 Encoders on XY robot, LED signalling

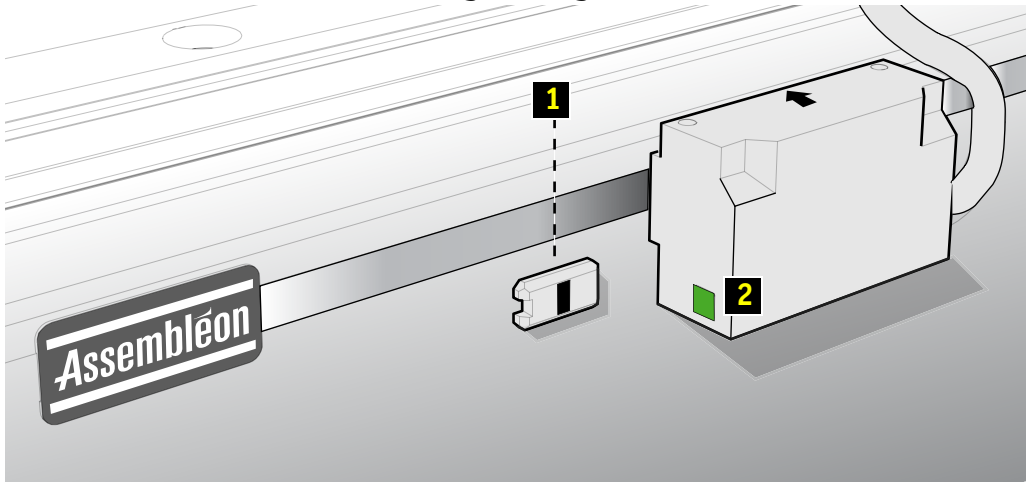


Figure 14 Encoder on XY robot

Encoder position	LED (2)
As shown in picture	Green
At reference marker (1)	Green, when passing the LED flashes red for 0.25 sec.

Figure 15 LED signalling encoder

G5.4 Diagrams

G5.4.1 XY robot, wiring diagram

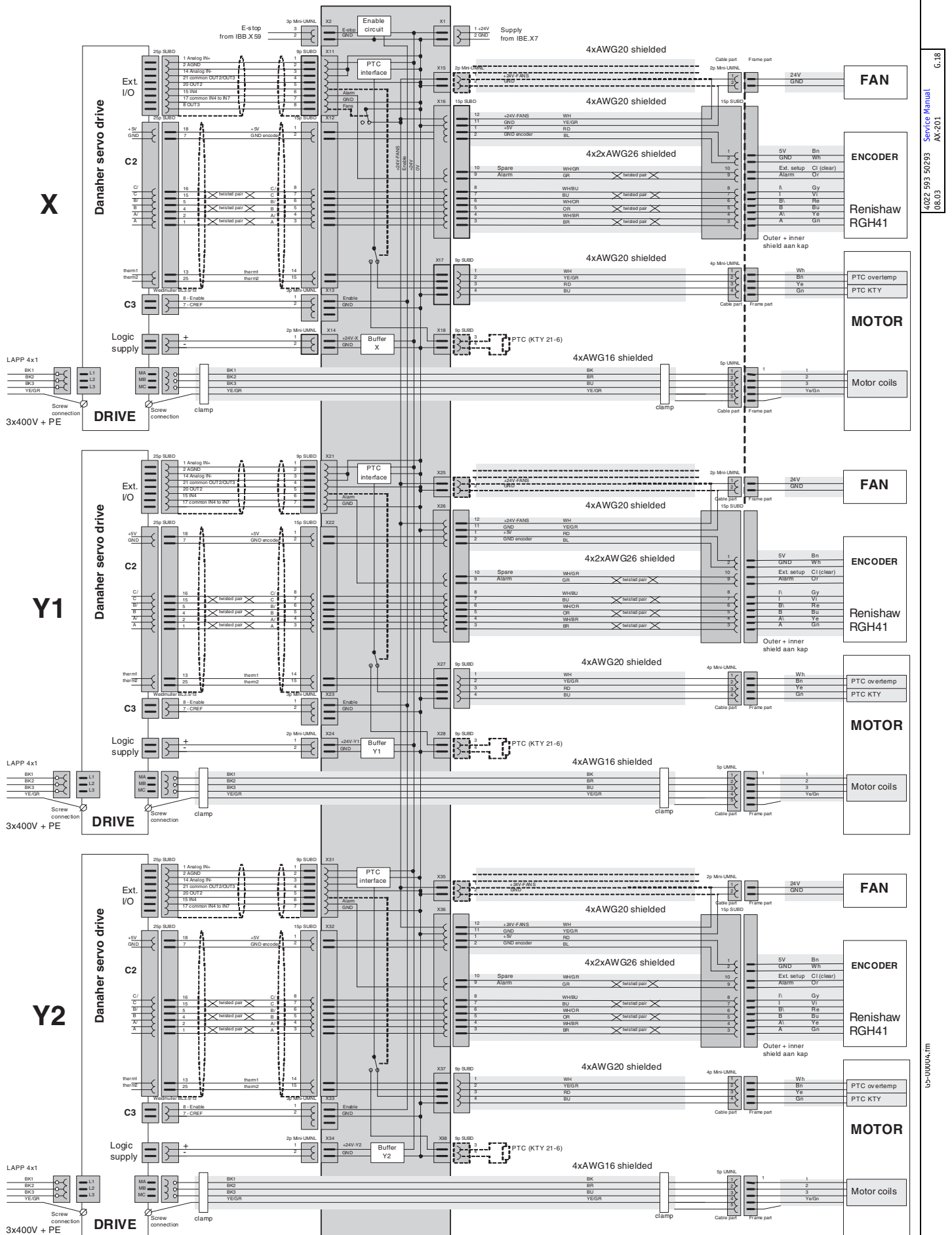


Figure 16 XY-robot, wiring diagram

CHAPTER G6 Measurement, adjustment and calibration

G6-00001.fm

G6.1 Encoder on Y-axis, adjustment

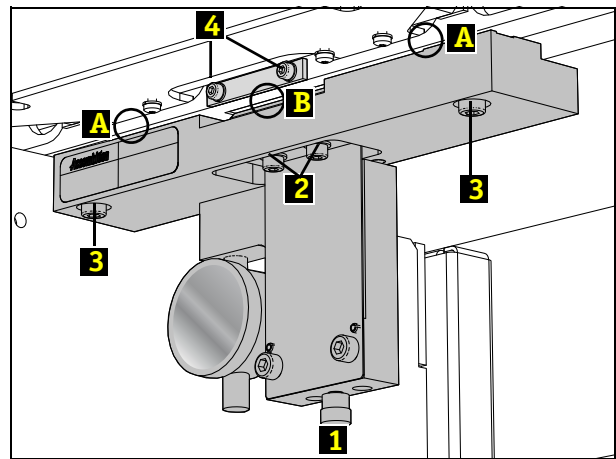
Estimated time to complete [min.]:	20
Required special tools:	Encoder adjustment tool, see A8.5.3 Maintenance kit (PA 2440/00)
Required part(s)	Loctite 243

1. Prerequisites

- Place XY robot in the middle of the machine (above the board transport).

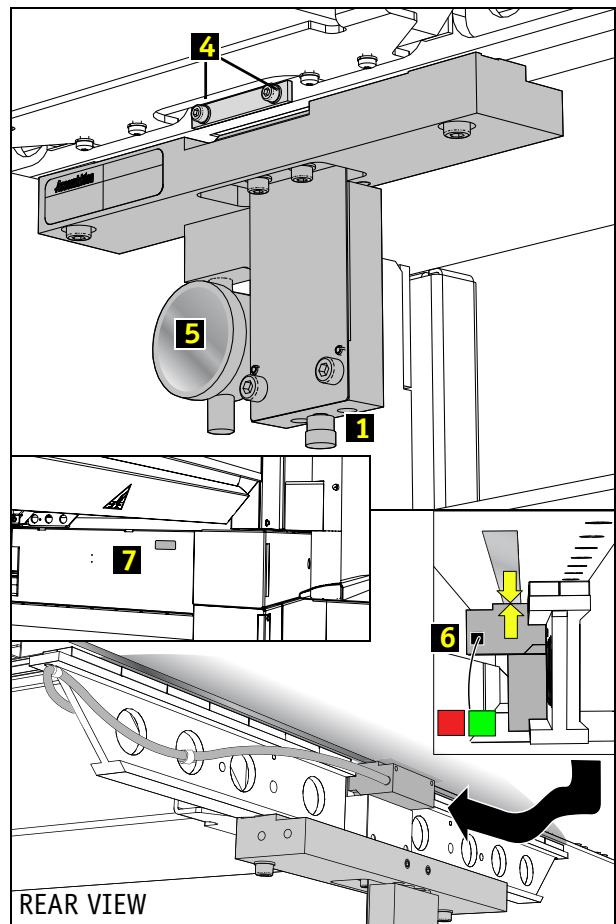
2. Place encoder adjustment tool

- Keep tool against the beam and turn the knob (1) until the tool touches the beam (A) and the encoder block (B) at the same time.
- Finger tighten the two outer screws (3).
- Finger tighten the two screws in the encoder block (2).
- Loosen the encoder (4).
- Secure bolts (2,3).



3. Adjust encoder

- Power up the machine (and press the start button).
- Turn the knob (1) **clockwise** to the limit.
- Turn the knob (1) **slowly counter clockwise**, and find the point where the LED (6) switches from RED to GREEN.
- Set the clock gauge (5) to 0.0.
- Turn the knob (1) **slowly counter clockwise**, and find the point where the LED (6) switches from GREEN to RED.
- Read out the clock gauge (5, e.g. +0.32).
- Range in this example is 0.32, meaning an average value of $0.32/2 = +0.16$
- Read the offset value from the sticker (7, e.g. -0.05)
- Adjust encoder to $0.16 + (-0.05) = +0.11$
- Turn the knob (1) to 0 and then to the calculated value.



4. Secure encoder

- Remove the two mounting bolts (4) and apply Loctite 243, one by one.

5. Finalize

- Remove tool. Start with screws (2) holding the encoder block.
- Adjust reference marker, see [G6.3 Reference markers on X and Y axes, adjustment](#).

G6-00003.fm

G6.2 Encoder on X-axis, adjustment

Estimated time to complete [min.]: 20

Required special tools. Loctite 243, adjustment spacer, [A8.5.3 Maintenance kit \(PA 2440/00\)](#)

Required part(s) -

1. Prerequisites

- Power up the machine and remove the trolleys at the front.
- Remove the BA camera **with** the bracket, see [G8.4 Encoder on X-axis, replacement](#) .
- Remove the mounting bolts (1).
- Clean the bolts (1) and apply Loctite 243.
- Finger tighten the bolts (1).

2. Adjust the X-axis encoder

- Power up the machine.
- Position two adjustment spacers (2) (0.8 mm) between encoder and linear scale.
- Press encoder against the adjustment spacers and secure encoder (1).

Note: Tighten the left bolt first.

- Remove adjustment spacers (2).

3. Check the X-axis encoder

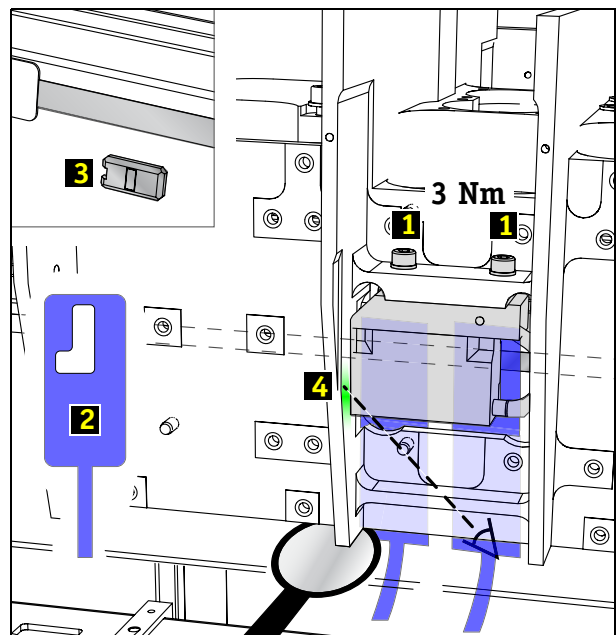
- Check if LED (4) is green.

Note: Look in the direction as indicated, or use a mirror to see the shine of the LED.

- Check if LED (4) is flashing red (± 0.25 sec) at the reference marker location (3).
- Adjust reference marker, if necessary, see [G6.3 Reference markers on X and Y axes, adjustment](#)
- Adjust encoder if LED is not OK.

4. Finalize

- Power down the machine.
- Install the BA camera, see [F8.1.1 BA camera, replacement](#) .



G6.3 Reference markers on X and Y axes, adjustment

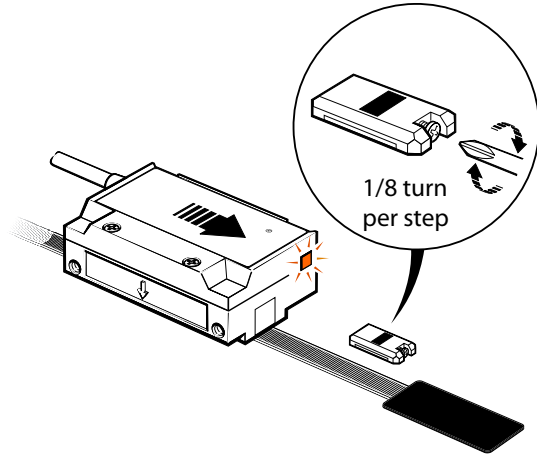
Estimated time to complete [min.]: 10

Required special tools. -

Required part(s) -

1. Adjusting the reference marker

- Move the encoder over the reference marker in the direction shown on picture.
- The reference marker is adjusted correctly when the LED flashes red for 0.25 seconds.
- If it flashes orange or goes blank, the reference marker adjuster screw should be turned anti-clockwise by 1/8 turn steps and the procedure repeated until a red flash is obtained.



G6-00004.fm

G6.4 Sweepers on X and Y axes, adjustment

Estimated time to complete [min.]: -

Required special tools. Feeler gauge

[A8.6.3 Recommended standard tools](#)

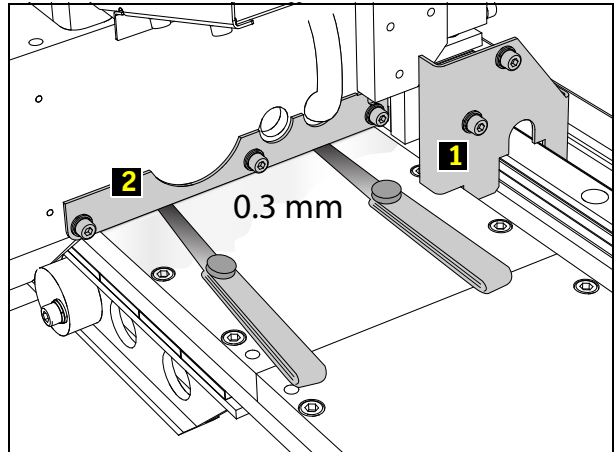
Required part(s) -

1. Prerequisites

- Remove the trolleys.
- Power down the machine.

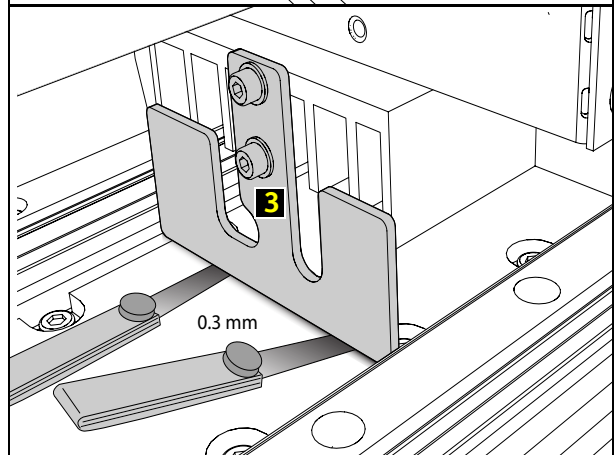
2. Adjust sweepers on Y axis

- Remove cover (1).
- Adjust sweeper (2), use feeler gauge of 0.3 mm.
- Secure sweeper, apply Loctite 243.
Tightening torque 2 Nm.
- Adjust cover (1), use feeler gauge of 0.3 mm.
- Apply Loctite 243.
Tightening torque 2 Nm.



3. Adjust sweepers on X axis

- Adjust sweeper (3), use feeler gauge of 0.3 mm.
- Secure sweeper, apply Loctite 243.
Tightening torque 2.9 Nm.



CHAPTER G7 Maintenance instructions



NOTE: Operation, adjustment, maintenance and repair of this machine shall be carried out by **qualified and trained** personnel only.

This chapter contains detailed (corrective and preventive) maintenance instructions.

The preventive maintenance intervals are defined in [A7.3 Preventive maintenance schedule](#) .

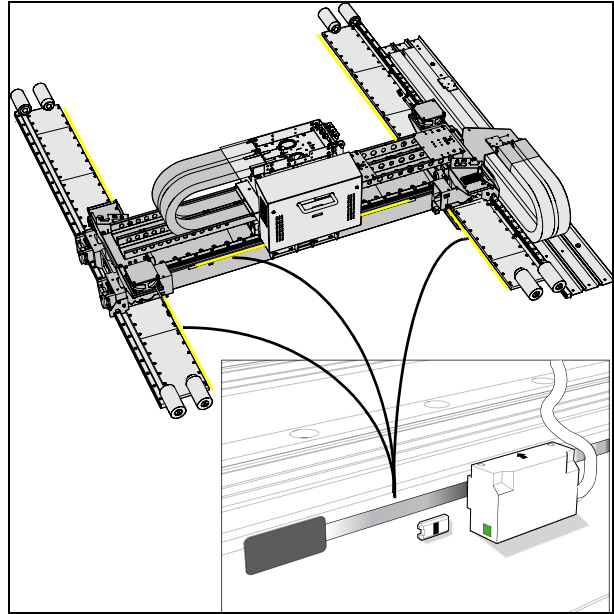
For Material Safety Data Sheets, see [A2.12 Material safety data sheets \(MSDS\)](#)

G7.1 Linear scales on XY robot, cleaning

Estimated time to complete [min.]: 2
 Required special tools. Ethanol
 Required part(s) -

1. Cleaning linear scales and reference markers

- Move the XY robot by hand and clean the newly exposed surface of the X and each Y axis linear scale with ethanol.
- Visually inspect the linear scales and reference markers for signs of wear or damage.



G7-00002.fm

G7.2 Linear guides on XY robot, cleaning and lubricating

Estimated time to complete [min.]:	30
Required special tools	Grease gun with Kluber Isoflex Topas NCA52, see A8.5.3 Maintenance kit (PA 2440/00) , vacuum cleaner (with plastic attachments) fibre free tissues.
Required part(s)	-



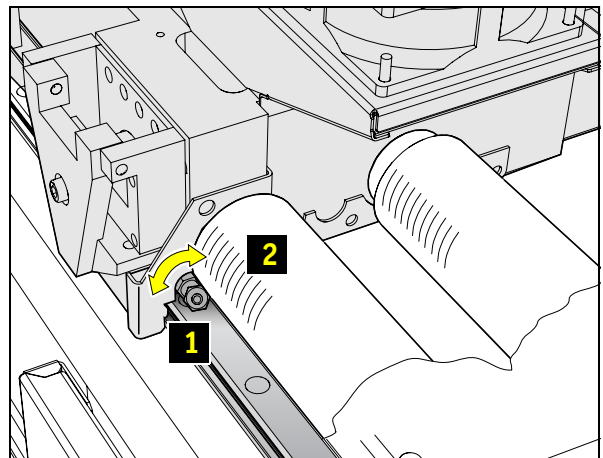
IRRITATING SUBSTANCE

Direct contact may cause irritation of the skin.
Avoid direct contact. Use Personal Protection Equipment.

Until further notice

- Lubricate the linear guides every **2 months**.
- Rotate the grease nipple (1) on the Y1 and Y2 axe to make it accessible for the grease gun.
- Apply 3-6 shots while moving the XY robot.
- Turn the grease nipple (1) back in the initial position to avoid collision with the end stop spring (2).

Check if grease nipple (1) can pass the end stop spring (2) by moving the XY robot by hand.



1. Prerequisites

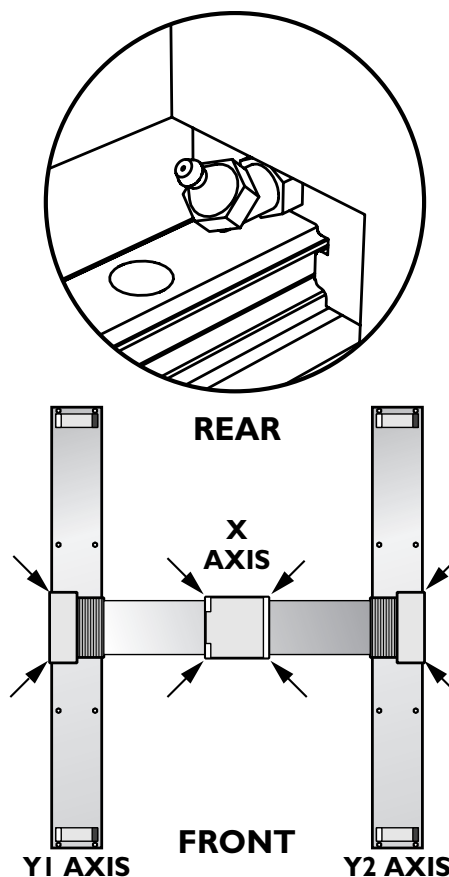
- Remove the trolleys.
- Power down the machine.
- Clean the XY robot area using a vacuum cleaner with plastic attachments to avoid scratching.

2. Cleaning the linear guide rails

- Move all carriages by hand and clean the newly exposed surface of each linear guide rail with fibre free tissues.
- Remove old grease and contaminations.

3. Lubricating the linear guides

- The following grease instructions should be performed at all 3 axis.
 - * Inject **slowly** and with a light pressure two or three shots of grease into the grease nipples. During this action, slowly move the carriage back and forth.
 - * Check if a thin layer of grease is visible at each ball way. If there is grease on other places, the grease was probably injected too fast, or the carriage has not been moved. In that case the procedure must be repeated.
 - * Tilt and remove the grease gun.
 - * Remove excessive grease from all guides, rails and nipples.



G7.3 Fans on X axis, cleaning

Estimated time to complete [min.]: 20

Required special tools. -

Required part(s) -

1. Prerequisites

- Remove the fans, see [G8.9 Fans on X-axis, replacement](#)

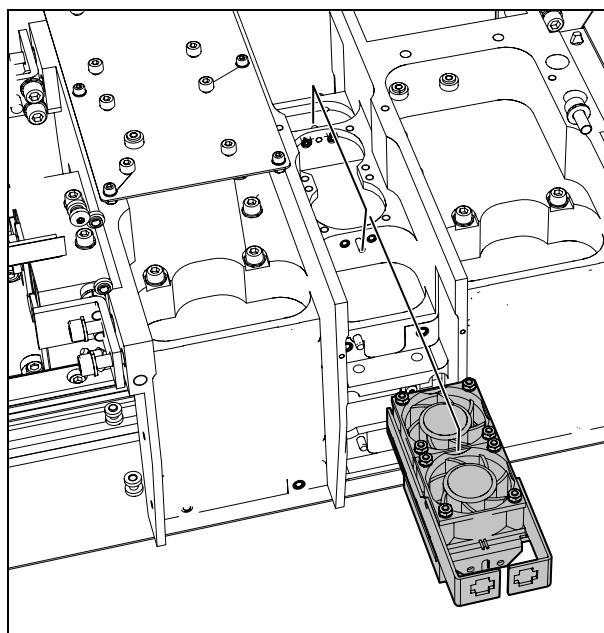
Note: Perform this procedure at the side with the placement heads HA

2. Clean the fans

- Clean the fans with compressed air.

3. Finalize

- Install the fans, see [G8.9 Fans on X-axis, replacement](#)



G7-00005.fm

G7.4 Fans on Y axis, cleaning

Estimated time to complete [min.]: 30
 Required special tools: Vacuum cleaner
 Required part(s) -

1. Prerequisites

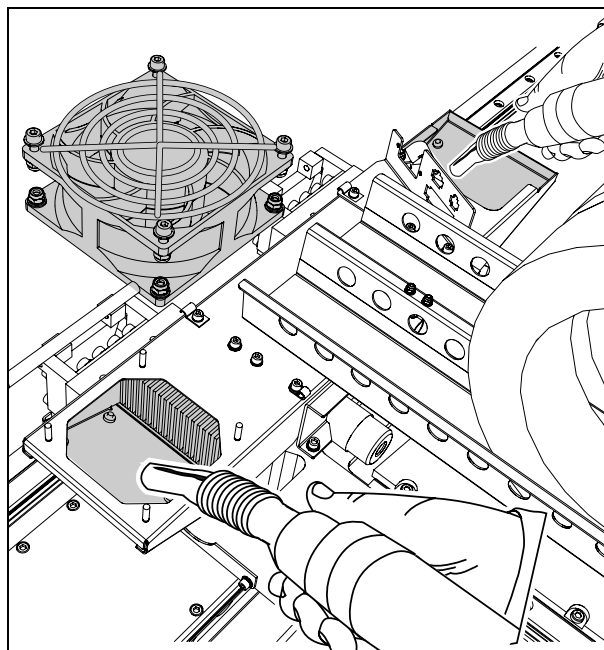
- Remove the fans, see [G8.8 Fans on Y-axis, replacement](#)

2. Clean the fans left and right

- Clean the fans with pressed air.
- Clean the air channels.

3. Finalize

- Install the fans, see [G8.8 Fans on Y-axis, replacement](#)



G7-00006.fm

G7.5 Encoders on XY robot, cleaning

Estimated time to complete [min.]: 10
Required special tools. Ethanol
Required part(s) -

1. Prerequisites

- Power down the machine.
- Remove the trolleys.

2. Remove the encoder

On X-axis:

- Remove the encoder, see [G8.4 Encoder on X-axis, replacement](#)

On Y-axes:

- Remove the encoder, see [G8.3 Encoder on Y-axis, replacement](#)

3. Cleaning the encoder

- Using fibre free tissue moistened with ethanol.
- Clean the linear scales, see [G7.1 Linear scales on XY robot, cleaning](#)

4. Install the encoder

On X-axis:

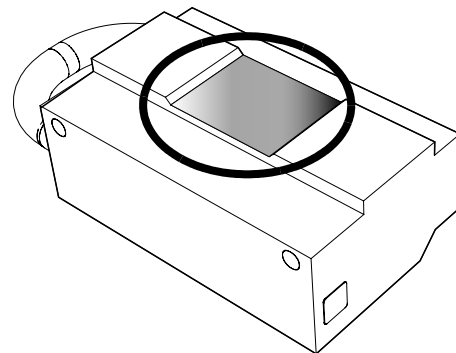
- Install the encoder, see [G8.4 Encoder on X-axis, replacement](#)

On Y-axes:

- Install the encoder, see [G8.3 Encoder on Y-axis, replacement](#)

5. Finalize

- Clean the linear scales, see [G7.1 Linear scales on XY robot, cleaning](#)
- Power up the machine
- Check function of the encoders, see [G5.3.6 Encoders on XY robot, LED signalling](#)



CHAPTER G8 Installation and replacement instructions

G8-00001.fm

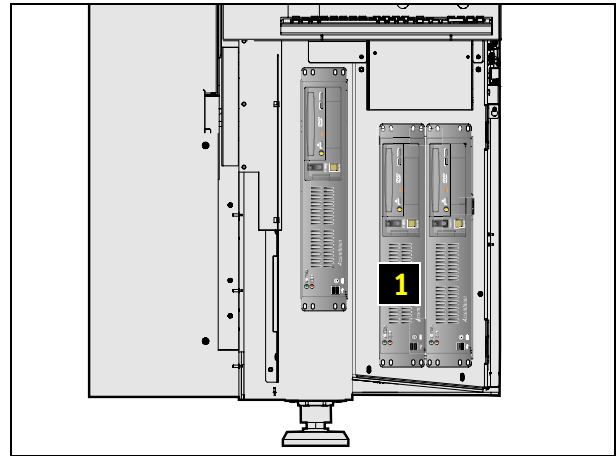
G8.1 XY controller, replacement

Estimated time to complete [min.]: -
Required special tools. -
Required part(s) [A8.4.12 XY robot, spares](#)

1. Prerequisites

- The XY controller is part of the process controller (1), see [B8.2 Controller \(system or process\), replacement](#)

Note: The process controller can only be exchanged as a complete module at the customer site. No parts are defined as a spare part. The complete controller is defined as an Assembleon repairable module.



G8-00002.fm

G8.2 Motion amplifier, replacement

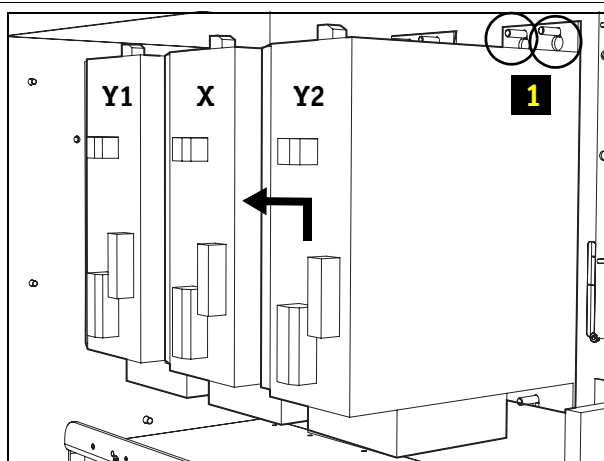
Estimated time to complete [min.]: -
 Required special tools: -
 Required part(s) [A8.4.12 XY robot, spares](#)

1. Prerequisites

- Power down the machine.
- Open the rear door.
- Pull out the control supply unit and locate the concerning motion amplifier (Y1, X, or Y2).

2. Replace the concerning motion amplifier

- Disconnect wiring.
- Loosen the two mounting bolts (1).
- Lift the motion amplifier and take it out.
- Place the new motion amplifier.
- Tighten the bolts.
- Connect wiring.



3. Finalize

- Power up the machine, and check the status of the motion amplifier, see [G5.3.5 Motion amplifier, LED signalling](#)
- Send back the motion amplifier in the original packaging.

G8.3 Encoder on Y-axis, replacement

Estimated time to complete [min.]:

Required special tools.

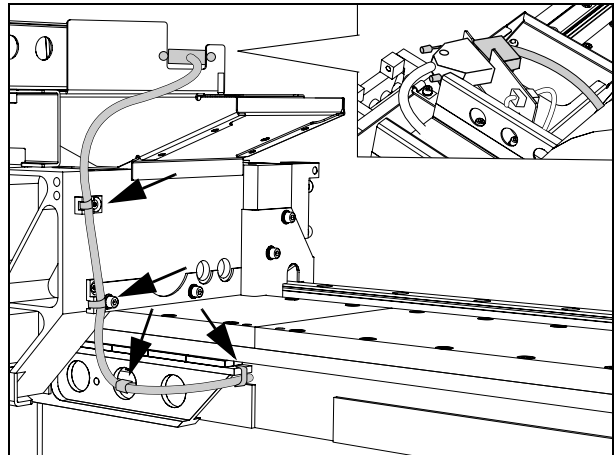
Required part(s) Loctite 243 [A8.4.12 XY robot, spares](#)

1. Prerequisites

- Place XY robot in the middle of the machine (above the board transport).

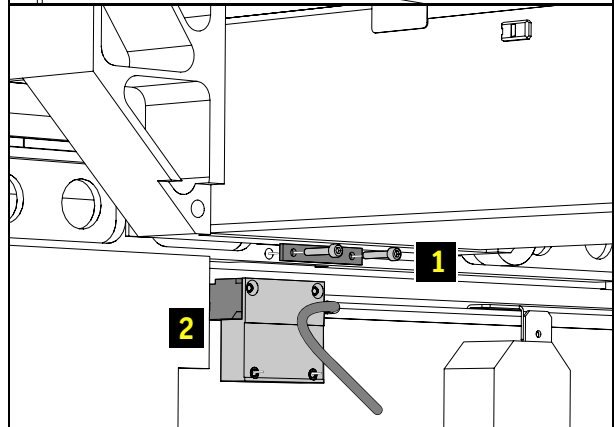
2. Remove encoder cable

- Disconnect connector.
- Cut all tie wraps.



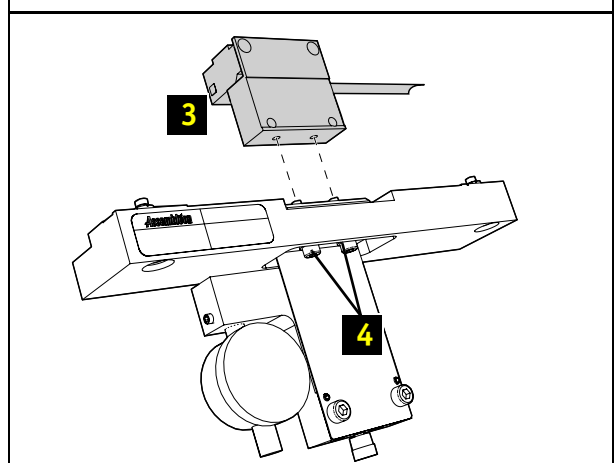
3. Remove encoder

- Loosen the two screws (1).
- Encoder with brackets (2) slides out.



4. Mount encoder

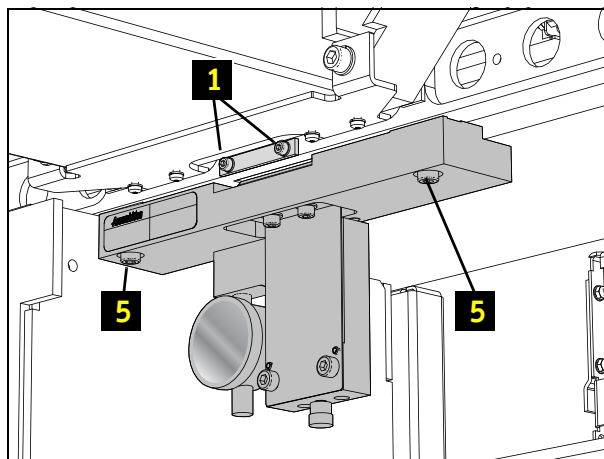
- Transfer the block to new encoder (3).
Apply Loctite 243 to the bolts.
- Mount the encoder assembly on the tool (4).



G8-00007.fm

5. Position the encoder

- Position tool with encoder.
- Tighten the bolts (5).
- Finger tighten the encoder with the two screws (1).

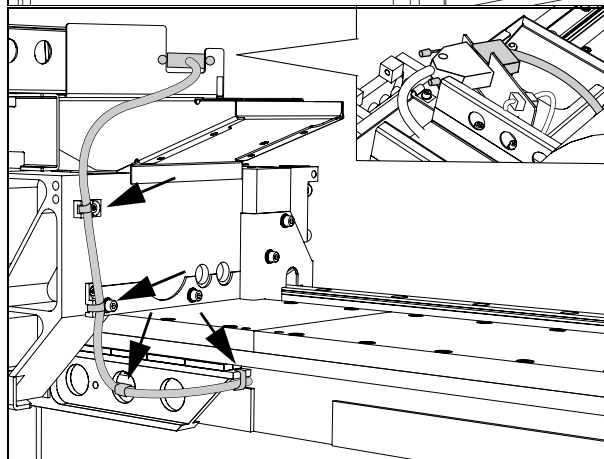


6. Mount encoder cable

- Connect connector.
- Secure cable with tie wraps.

7. Finalize

- Adjust the encoder, see [G6.1 Encoder on Y-axis, adjustment](#)



G8.4 Encoder on X-axis, replacement

Estimated time to complete [min.]: -
 Required special tools. Loctite 243, Adjustment spacer, [A8.5.3](#)
[Maintenance kit \(PA 2440/00\)](#)
 Required part(s) [A8.4.12 XY robot, spares](#)

1. Prerequisites

Note: Perform this procedure at the front side of the XY robot.

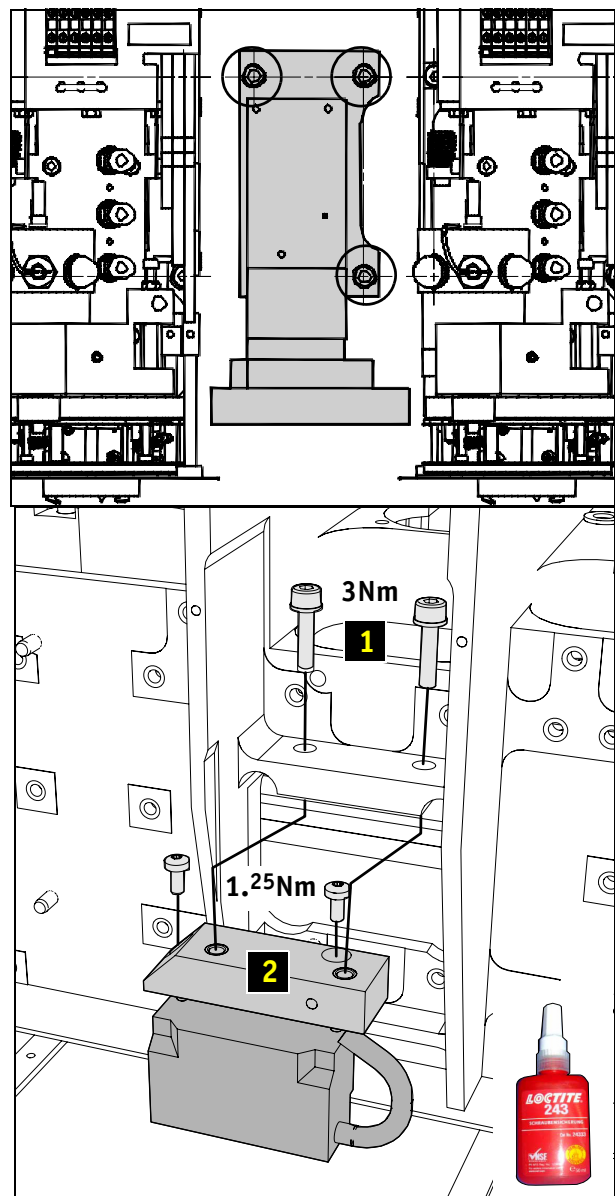
- Remove the trolleys at the front.
- Power down the machine.
- Remove the BA camera **with** bracket.
- Note the position of fan cable and tie wraps.
- Note the position of encoder cable and tie wraps.

2. Replace the encoder

- Loosen connector.
- Loosen two bolts of encoder bracket (1).
- Transfer bracket (2).
- Apply Loctite 243 to mounting bolts.
- Re-place encoder on the X-axis.
- Finger tighten the bolts (1).

3. Adjust encoder

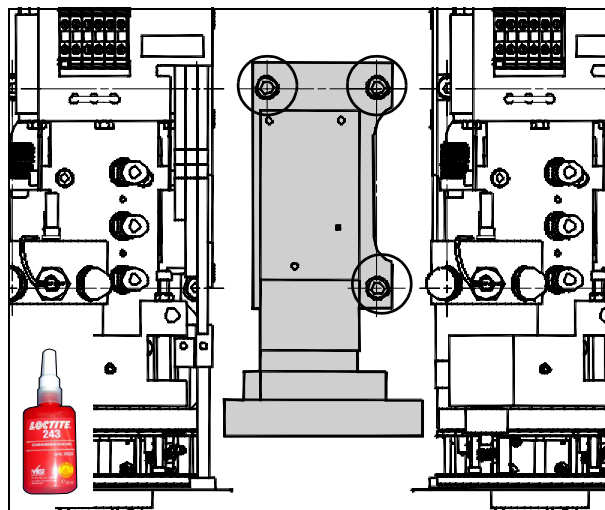
- Adjust the X-axis encoder, see [G6.2 Encoder on X-axis, adjustment](#) , step 2



G8-00004.fm

4. Mount BA camera with bracket

- Press the BA camera downwards when tightening.
- Apply Loctite 243 to mounting bolts.
- Tightening torque 6 Nm.
- Perform an exchange calibration of the BA camera, see [A6.1.1 Exchange calibration procedure](#).



G8.5 Linear scale on X-axis, replacement

Estimated time to complete [min.]: -

Required special tools: Linear scale tool X-axis, [A8.5.3 Maintenance kit \(PA 2440/00\)](#) Ethanol, scalping-knife

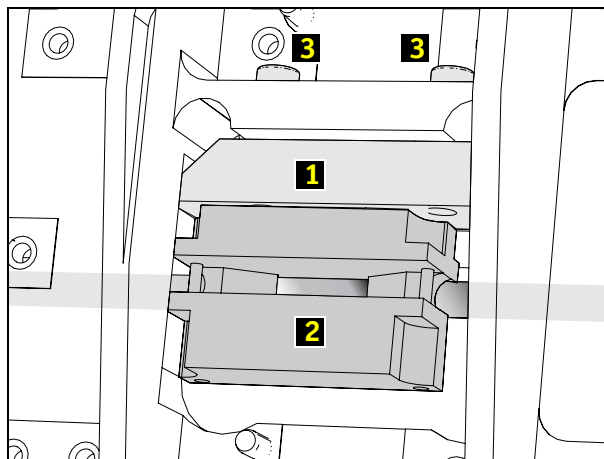
Required part(s) [A8.4.12 XY robot, spares](#)

1. Prerequisites

- Remove the encoder, see [G8.4 Encoder on X-axis, replacement](#)

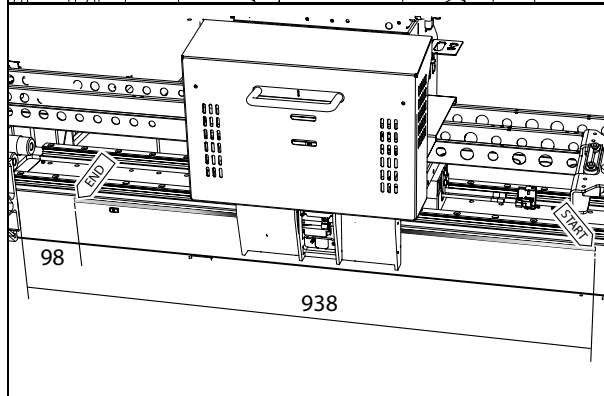
2. Mount tool

- Transfer encoder block (1) to linear scale tool (2).
- Push tool gently as far as possible against the beam and secure, using the same bolts (3).



3. Mark start and end position of linear scale

- Remove end clamps (left and right).
 - Copy the start and end position of the linear scale from the old scale.
- OR**
- Mark the start and end of the linear scale using a flexible steel rule.
 - Mark on a place where no cleaning is required.

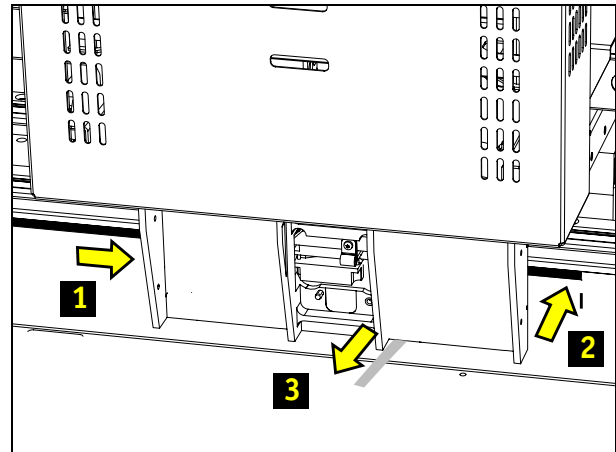


4. Clean linear scale area

- Remove old scale.
- Scrape the remaining glue from end plates from the X-beam.
- **Clean the surface firmly with ethanol to remove any dust, coloured particles grease or fat.**
Clean at least eight times.
Use each time a new fibre free tissue.
- Wait at least **15 minutes** before mounting the new scale.

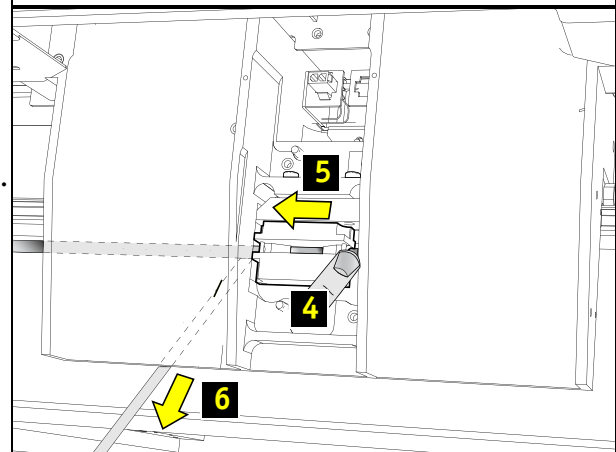
5. Start

- Lead linear scale through the X carriage (1).
- Remove foil of scale and press scale lightly on start position (2).
- Pull foil from underneath the X-carriage (3).



6. Stick the linear guide

- Move X-carriage to start position.
- Gently move the X-carriage to the left (5) while pressing the scale to the X-beam by finger (4).
- Pull the foil with the other hand (6) meanwhile.



7. Stick the end clamp covers on both sides

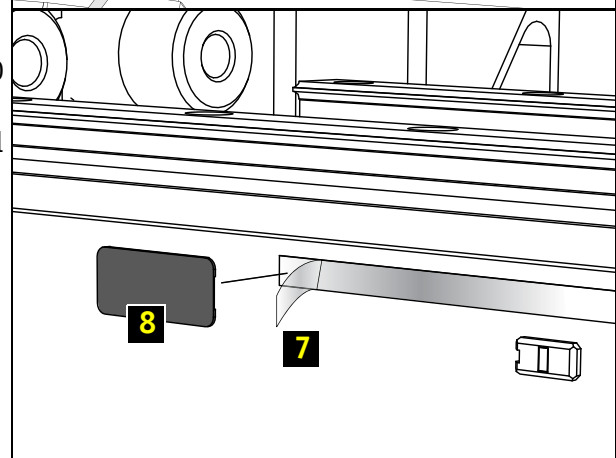
- Remove the coating from the linear scale over 10 mm (7). Use a scalping-knife.

Note: This to gain a better contact surface for the end clamp cover (8).

- Use the glue supplied with the end clamp.

8. Finalize

- Remove tool.
- Install encoder, see [G8.4 Encoder on X-axis, replacement](#)



G8.6 Linear scale on Y-axis, replacement

Estimated time to complete [min.]:	-
Required special tools:	Linear scale tool Y-axis, see A8.5.3 Maintenance kit (PA 2440/00) Ethanol, scalping-knife Loctite 495 (obtain locally)
Required part(s)	A8.4.12 XY robot, spares

1. Prerequisites

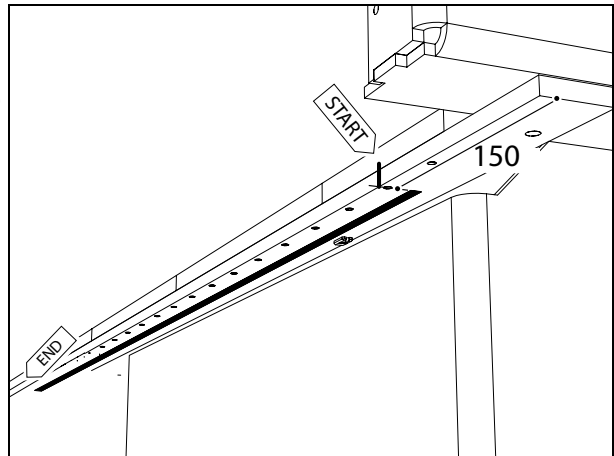
- Remove encoder, see [G8.3 Encoder on Y-axis, replacement](#)

2. Clean linear scale area

- Use a scalping-knife to remove the old linear scale.
- Clean the surface firmly.
- Remove all glue residue, use knife and sticker remover,
- Clean the surface with ethanol.

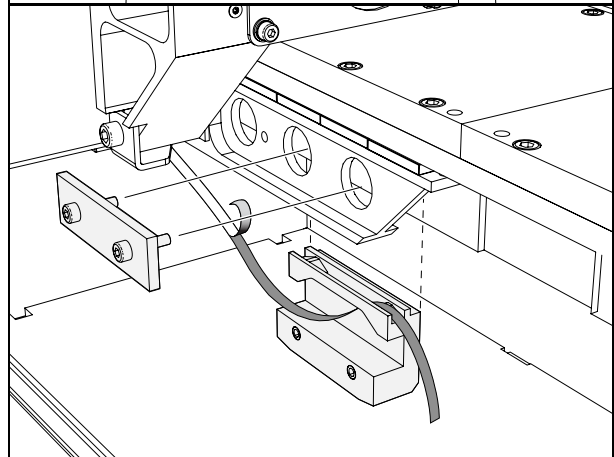
3. Mark start and end position of linear scale

- Mark the start position of the linear scale using a flexible steel rule (measured from the rear side of the machine).



4. Prepare tool

- Place linear scale in base.
- Place tool at the rear side of the X-beam.
- Peel off foil and guide linear scale through the tool.



5. Mount tool

- Check if the linear scale or foil does not get squeezed between tool and base.
- Push (1) and secure the tool (2).

6. Stick the linear scale, rear part

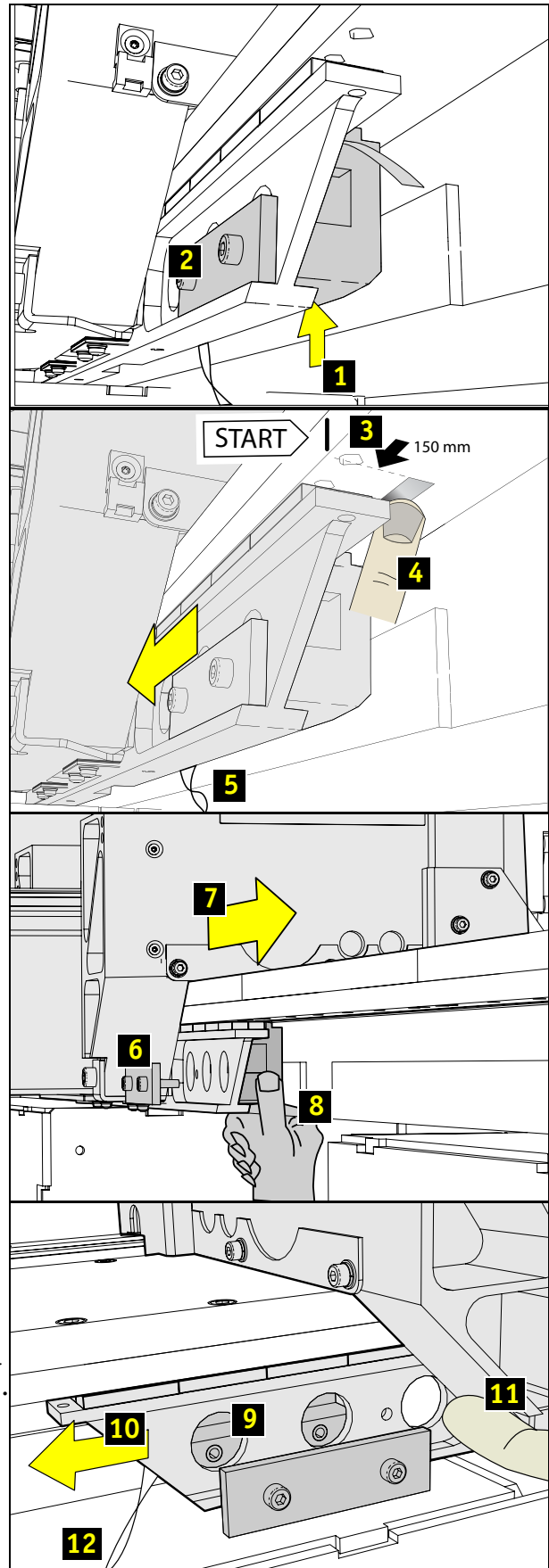
- Move X-beam towards start position (3).
- Stick linear scale at start position.
- Slide X-beam to the front while pulling foil (5) and pressing (4) the linear scale.
- Stop half way.

7. Transfer tool to the front

- Loosen tool (6).
- Slide the X-beam to the rear (7) while keeping the tool (8) in place.

8. Stick the linear scale, front part

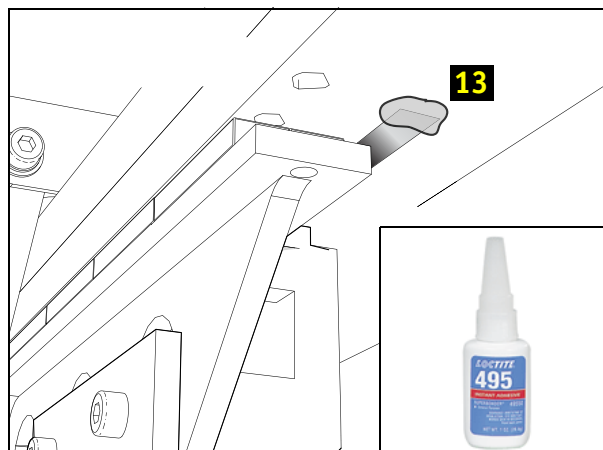
- The tool appears at the front side of the X-beam.
- Mount tool on position as shown (9), see step [5. Mount tool](#)
 - Slide X-beam to the front (10) while pulling foil (12) and pressing the linear scale by finger (11).



G8-00015.fm

9. Finalize

- Apply Loctite 495 (obtain locally) to both ends of the scale (13) to prevent peeling off.
- Mount encoder, see [G8.3 Encoder on Y-axis, replacement](#)



G8.7 Reference markers on X and Y axes, replacement

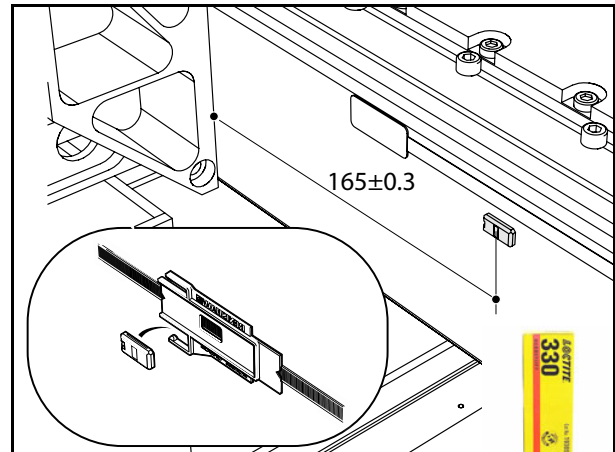
Estimated time to complete [min.]:	20 min. per reference marker
Required special tools.	-
Required part(s)	Loctite 330 A8.4.12 XY robot, spares

1. Prerequisites

- Remove the trolleys.
- Power down the machine.

2. Replacing the reference marker on the X axis

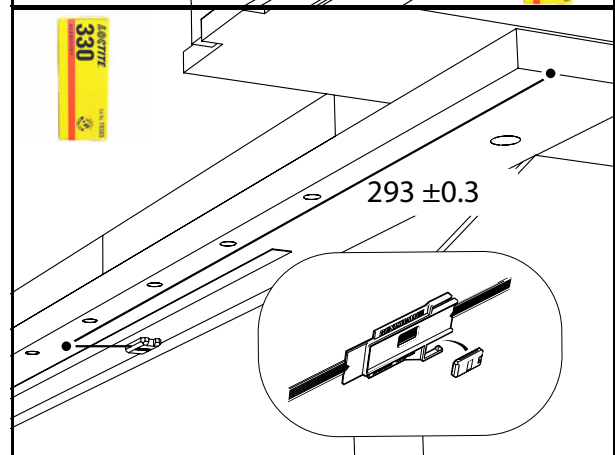
- Remove the old reference marker.
- Clean the area.
- Position the new reference marker with the enclosed tool.
- Glue the reference marker with Loctite 330.
- Adjust the marker, see [G6.3 Reference markers on X and Y axes, adjustment](#)



3. Replacing the reference marker(s) on the Y axes

Note: These reference markers are mounted at the back of the Y axes.

- Remove the old reference marker.
- Clean the area.
- Position the new reference marker with the enclosed tool.
- Glue the reference marker with Loctite 330.
- Adjust the marker, see [G6.3 Reference markers on X and Y axes, adjustment](#)



G8-00011.fm

G8.8 Fans on Y-axis, replacement

Estimated time to complete [min.]: 30

Required special tools. -

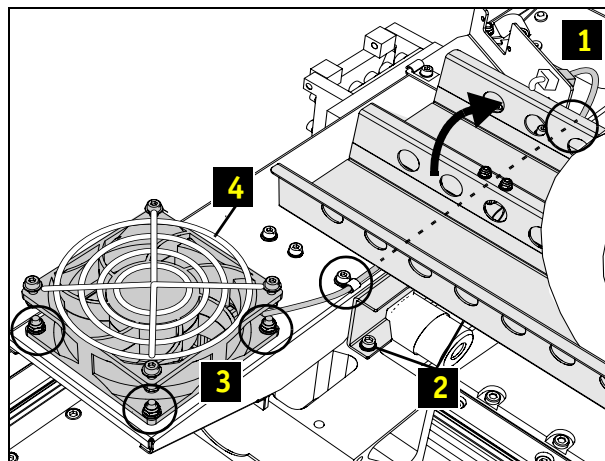
Required part(s) Loctite 243 [A8.4.12 XY robot, spares](#)

1. Prerequisites

- Remove the trolleys.
- Power down the machine.
- Note the position of fan cable and tie wraps.

2. Replace the fan

- Disconnect wiring (1) and release the cable from the air duct (two clamps).
- Loosen the two bolts (2) and remove wiring underneath the cable guide.
- Remove the four bolts and take the fan (3) out.
- Transfer the finger guard (4).
- Clean the area with a vacuum cleaner.
- Assembly in reverse order.
- Apply Loctite 243 to all mounting bolts.



G8.9 Fans on X-axis, replacement

Estimated time to complete [min.]: -
 Required special tools. Loctite 243
 Required part(s) A8.4.12 XY robot, spares

1. Prerequisites

Note: Perform this procedure at the side with the placement heads HA.

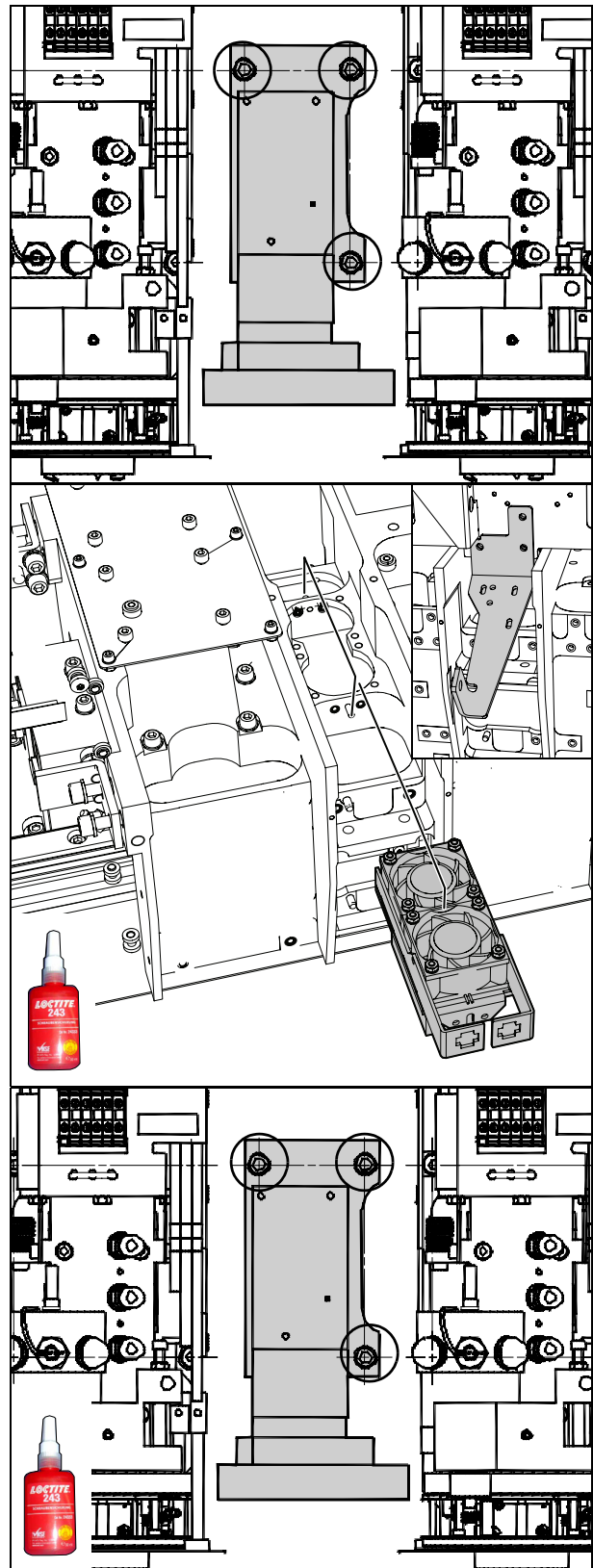
- Remove the trolleys.
- Power down the machine.
- Remove the BA camera **with** bracket.
- Note the position of fan cable and tie wraps.

2. Replace bracket with the fans

- Remove the BA camera cable bracket to gain better access to the fans.
- Disconnect the fan connector.
- Loosen the 2 bolts that secure the fan bracket.
- Lift the bracket with the fans and slide it backwards.
- Replace racket with fans.
- Apply Loctite 243 to the mounting bolts.

3. Mount BA camera with bracket

- Press the BA camera downwards when tightening.
- Apply Loctite 243 to mounting bolts.
- Tightening torque 6 Nm.
- Perform an exchange calibration of the BA camera, see [A6.1.1 Exchange calibration procedure](#) .



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Service Manual

A-series Tray Trolley

PHILIPS

Assembleon
Integrated electronics manufacturing solutions

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H. TRAY TROLLEY

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CHAPTER H1 Introduction

The tray trolley is a cart that forms the interface between components and the machine. Components are placed on trays stored in the tray trolley. The tray trolley is mounted on the base.

This part of the manual also covers the trolley lift cover, because it uses the same interface on the base.

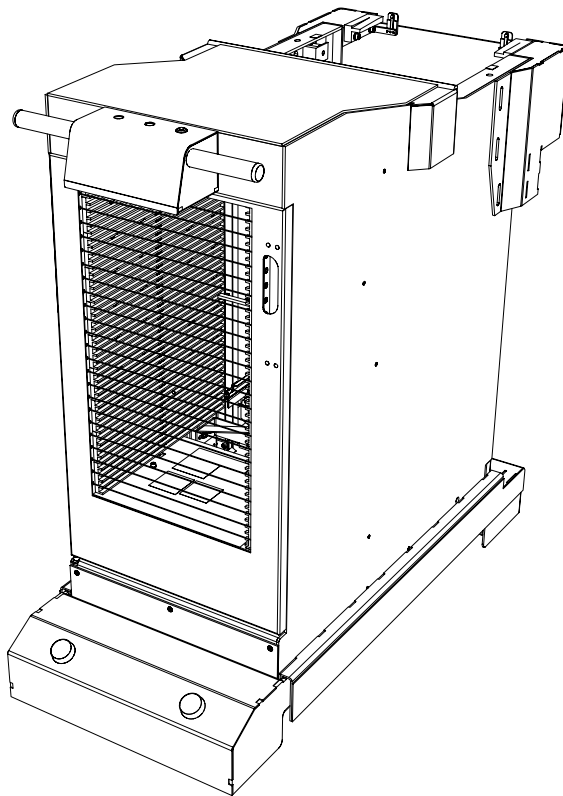


Figure 1 *Tray trolley*

CHAPTER H2 Safety and ergonomics

The trolleys are part of the whole machine.

Safety and ergonomics are also described for the machine as a whole.



HEAVY OBJECT (± 200 kg)
Improper lifting method may cause injury.
Use proper tools to lift the object.

CHAPTER H3 Technical specifications

H3.1 Tray trolley, identification

The trolley identification plates are located inside the trolley.

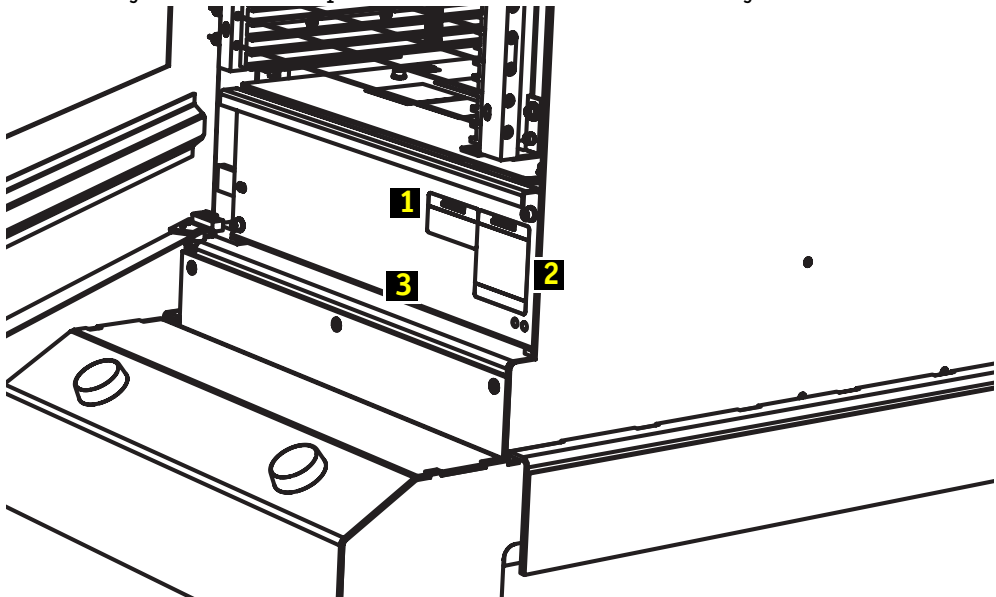


Figure 2 Identification plates on the A-series tray trolley

No.	Description	Format
1	Technical identification	12 digit number, last digit marked at bottom of sticker.
2	Commercial identification	6 digit PA-number: 2681/00 6 digit DC-number.
3	Service identification	5 digit M-number.

Figure 3 Identification plates on A-series tray trolley

CHAPTER H4 Functional description

H4.1 Tray trolley, overview

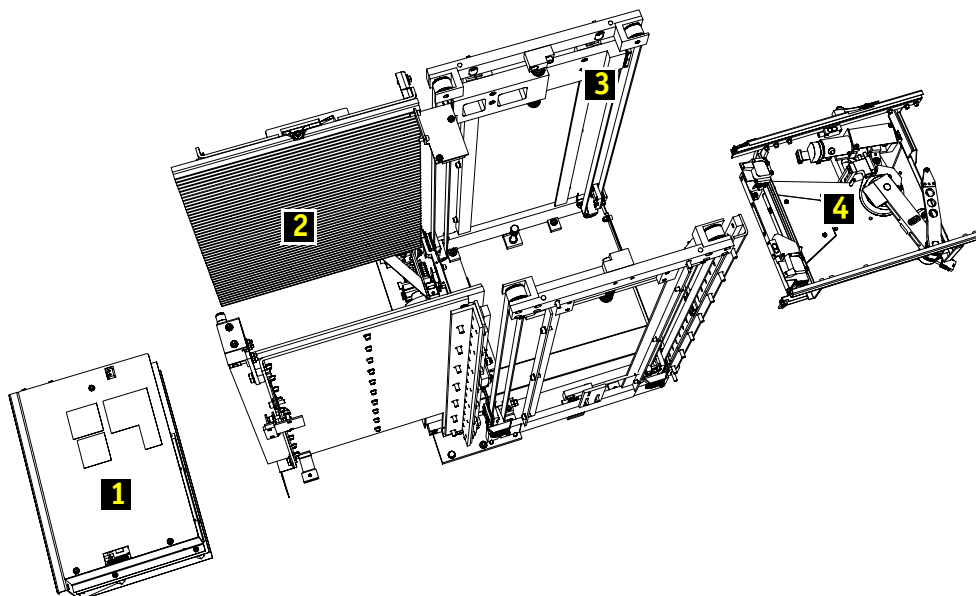


Figure 4 Tray trolley overview

1. Tray trolley controller cabinet
2. Tray carrier slots
3. Tray trolley lift
4. Tray lift.

H4.1.1 Tray lift

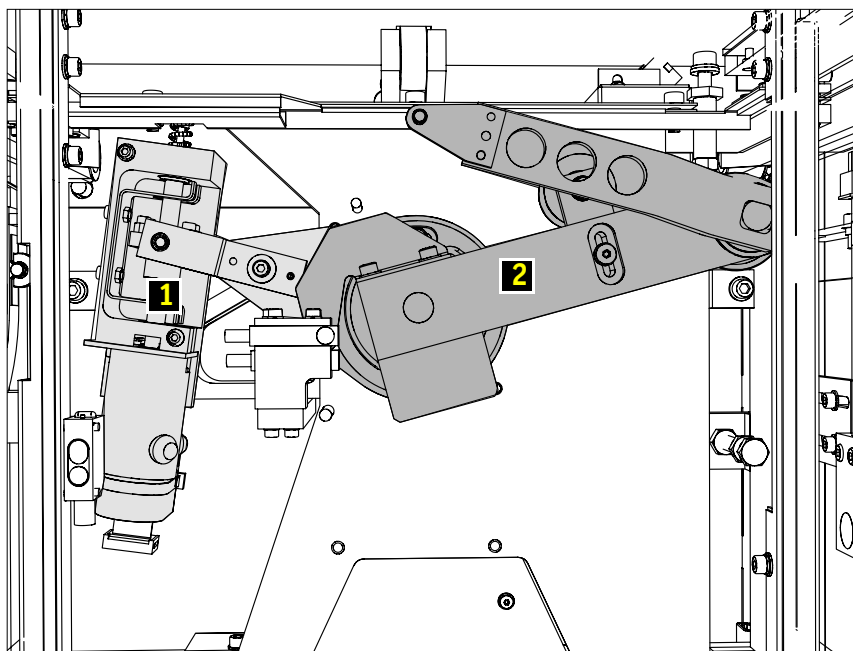


Figure 5 Tray trolley lift

The tray lift moves tray carriers, in vertical direction, up to pick-up level and back to the tray carrier slots. It utilises a servo-motor with a brake for machine safety.

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The servo system uses a zero_coarse EPD and an encoder for the homing action. The encoder produces 500 pulses per revolution and, counting the edges gives 2000 increments per revolution.

The pick-up level is related to the placement level of the system. The level is calibrated by the TTC with the assistance of an EPD and encoder. The TTC searches for a reference level on the trolley base by moving the lift slowly upwards starting at the zero point.

H4.1.2 Puller

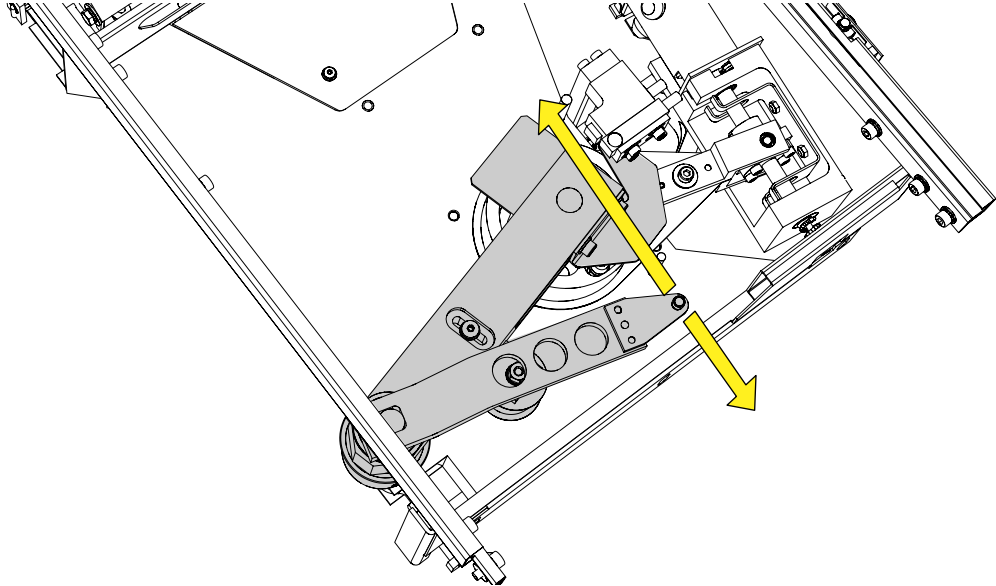


Figure 6 Puller

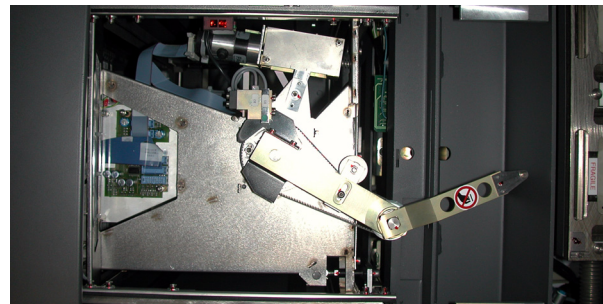
The puller moves a tray carrier through the tray trolley in horizontal direction. It utilizes a servo-motor with a brake, the servo-motor position is maintained stable by servo position control.

The servo system uses a zero_coarse EPD and an encoder for the homing action. The encoder produces 500 pulses per revolution and, counting the edges gives 2000 increments per revolution. At the end of the stroke, one revolution of the motor moves the puller 9 mm. The resolution and positioning of the puller catch pin is dependent on the position of the pin, at the end of the stroke the resolution is 4 mm.

Five puller positions are defined:

1. Pick

- The puller is at the end of stroke at the side of the work area, at this position a component may be picked from the selected tray.



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2. Lift

- The puller is in a position in which the selected tray carrier is on the lift while the lift can move without restriction (50 mm).

3. Park

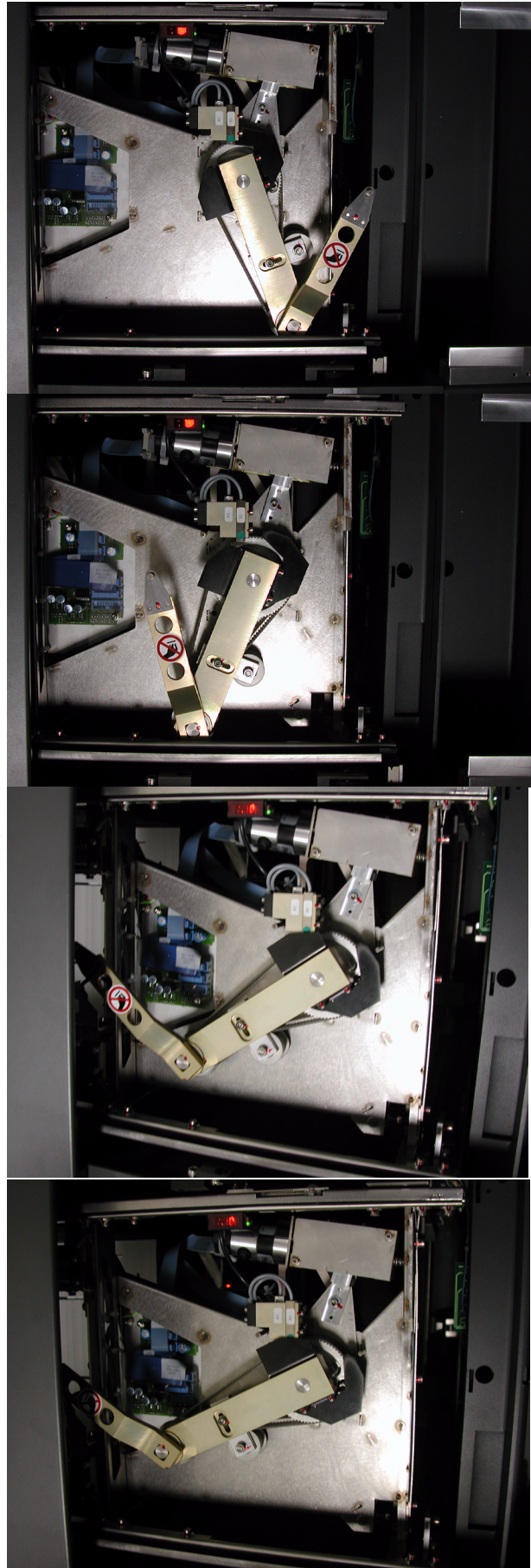
- The puller is at the side of the magazine in a position where the lift can move without restriction. There is no carrier on the lift.

4. Hook (snap-in)

- The puller is at the position where a tray carrier can be released or hooked-on by moving the snap-in mechanism.

5. Eject

- The puller is at the end of stroke at the side of the tray carrier. At this position the tray carrier is ejected (empty).



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H4.1.2.1 Snap-in function

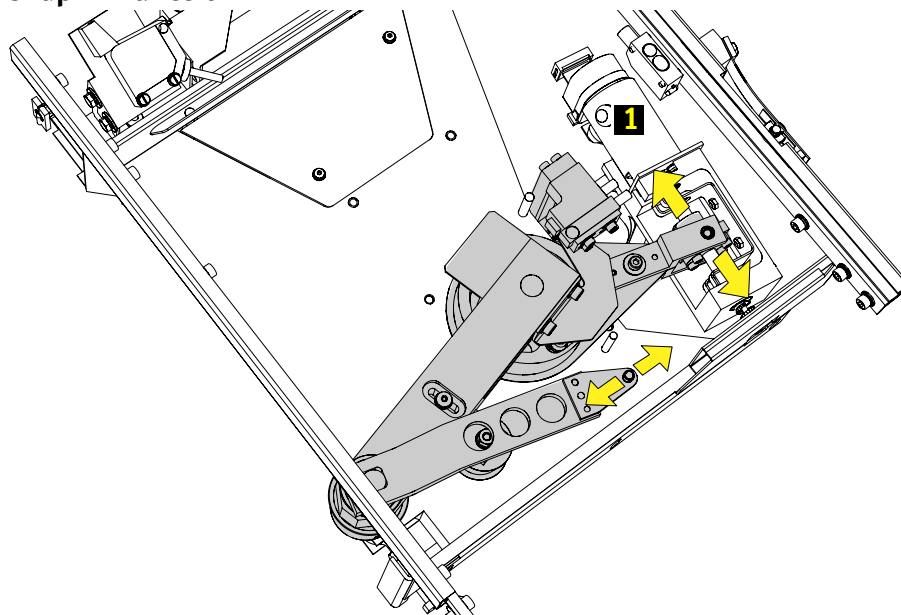


Figure 7 Snap-in mechanism

The snap-in mechanism is servo controlled and connects the carrier to the puller. All movements are done by components of the puller.

CHAPTER H5 Trouble shooting

H5.1 Trouble shooting work flow

H5.2 Diagnosis trees and tables

H5.2.1 Diagnosis trees, conventions

H5.2.2 Tray trolley, homing and initialising fault tracing

When homing and initialising the tray trolley, the following functions will be checked in this sequence:

	Check	When?
1	Checking servo systems	After power up
2	Look for EPD snap-in (B10)	After power up
3	Look for zero fine snap-in (encoder)	After power up
4	Snap-in to lock position (2)	After power up and every time the servo has been reset
5	Look for EPD lift (B06)	After power up
6	Look for zero fine lift (encoder)	After power up
7	Look for EPD puller (B02)	After power up
8	Look for zero fine puller (encoder)	After power up
9	Carrier present on lift (B03,B04)	After power up and every time the servo has been reset

Figure 8 Tray trolley, homing and initialising sequence

These checks can result in one of the following errors:

Error on screen				Corrective action
Feedback error (axis)	Unexpected error	Zero course not found (axis)	Zero fine not found (axis)	
X	-	-	X	H5.2.2.1.Encoder in tray trolley defective
?	?	?	?	H5.2.2.2.Encoder cable in tray trolley defective
X	-	-	-	H5.2.2.3.Tray trolley controller defective
-	-	X	-	H5.2.2.4.EPD sensor in tray trolley misaligned (B02, B06 or B10)
-	X	-	-	H5.2.2.5.EPD sensor in tray trolley defective (B02, B06 or B10)
X	-	-	-	H5.2.2.6.EPD wiring in tray trolley defective (B02, B06 or B10)
X	-	X	-	H5.2.2.7.Cable between tray trolley controller and motor defective
X	-	X	-	H5.2.2.8.Motor in tray trolley defective

Figure 9 Tray trolley, homing and initialising, errors

H5.2.2.1 Encoder in tray trolley defective

■ Encoder of lift motor defective

- Move lift manually and check zero fine with the encoder test tool.
- EPD (B06): [H6.7 EPD B06 in tray trolley, adjustment](#)
- Zero fine:
- Check offset between course and fine, see [H6.8 Tray trolley lift, checking the offset between the lift EPD \(B06\) and the lift motor encoder zero fine](#)

■ Encoder of snap-in defective

- Move snap-in manually and check zero fine with the encoder test tool.
- EPD (B10): [H6.11 Snap-in zero coarse EPD B10 adjustment for 'lock' position](#)

- Zero fine:
- Encoder of puller arm defective
 - Move snap-in manually and check zero fine with the encoder test tool.
 - EPD (B02): [H6.4 EPD B02, puller safe / puller zero coarse adjustment](#) , [H6.3 EPD B01 puller in stock area, adjustment](#)
 - Zero fine:

H5.2.2.2 Encoder cable in tray trolley defective

- Encoder cable lift motor defective
 - Check voltages, for zero fine use the encoder test tool.
 - EPD (B06): replace cable
 - Zero fine: replace cable
 - Adjustment of sensor, see [H6.7 EPD B06 in tray trolley, adjustment](#)
- Encoder cable snap-in defective
 - Check voltages, for zero fine use the encoder test tool.
 - Zero course (B10): replace cable
 - Zero fine: replace cable.
 - Adjustment of sensor, see [H6.11 Snap-in zero coarse EPD B10 adjustment for 'lock' position](#)
- Encoder cable puller arm defective
 - Check voltages, for zero fine use the encoder test tool.
 - Zero course (B02): replace cable
 - Zero fine: replace cable.
 - Adjustment of sensor, see [H6.4 EPD B02, puller safe / puller zero coarse adjustment](#) , [H6.3 EPD B01 puller in stock area, adjustment](#)

H5.2.2.3 Tray trolley controller defective

- Defective controller card
 - Check the LED settings, see [H5.3.1 Tray trolley controller, LED status check](#)
- Defective fuse on piggy board
 - Location and type of the fuse, see [H5.3.1 Tray trolley controller, LED status check](#)
 - Check by measuring the resistance of the fuse.

H5.2.2.4 EPD sensor in tray trolley misaligned

- check adjustment of zero course sensors
 - B02, see [H6.4 EPD B02, puller safe / puller zero coarse adjustment](#) , [H6.3 EPD B01 puller in stock area, adjustment](#)
 - B06, see [H6.7 EPD B06 in tray trolley, adjustment](#)
 - B10, see [H6.11 Snap-in zero coarse EPD B10 adjustment for 'lock' position](#)

H5.2.2.5 EPD sensor in tray trolley defective

- Check the sensors B02, B06 or B10
 - Location of sensor, see [H5.3.3 Tray trolley, sensors and switches, overview](#)
 - Check them manually. Keep a piece of paper in front of the sensors to check if there is a beam.

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H5.2.2.6 EPD wiring in tray trolley defective

- Check the sensors B02, B06 or B10
 - **B02:** Check the voltage of point 5 off connector X2 on the bottom of the lift, see?
 - **B06:** Check the voltages of points 1,11 and 20 of connector block X2 on the bottom of the lift.
 - **B10:** Check the voltages of point 10 of connector block X2 on the bottom of the lift.
 - Replace wiring if necessary.

H5.2.2.7 Cable between tray trolley controller and motor defective

See [H5.2.2.8.Motor in tray trolley defective](#)

H5.2.2.8 Motor in tray trolley defective

- Lift motor defective
 - Check voltages on point 1,2 and 3 of connector block X5
- Snap-in motor defective
 - Check voltages on point 1,2,3,4 and 5 of connector block X1
- Puller motor defective
 - Check voltages on point 1,2 and 3 of connector block X1

H5.2.3 Tray trolley, carrier select problems

Error on screen			Corrective action
Carrier not present	Unable to get carrier	Wrong snap-in position	
X	-	-	H5.2.3.1.Sensor B08,B09 defective
X	-	-	H5.2.3.2.Sensor B08, B09 misalignment
X	-	-	Defective sensor wiring (B08 and/or B09)
X	-	-	Damaged reflecting spots in the tray carrier
X	X	-	Lift out of alignment
X	-	-	No carrier present in selected position
-	X	-	Carrier in the ejected position
-	X	-	Defective sensor (B04)
-	X	-	Defective sensor wiring (B04)
-	X	-	Misalignment of puller arm assy
-	X	-	Damaged puller tip
-	-	X	Defective sensor (B10)
-	-	X	Defective sensor wiring (B10)
-	-	X	Misalignment sensor (B10)

Figure 10 Errors and causes

H5.2.3.1 Sensor B08,B09 defective

■ Check sensor(s)

- B08: Check voltage on point 4 off connector X2 (20V).
- B09: Check voltage on point 6 off connector X2 (20V).
- If defect, replace sensor. See [H8.20 Light sensors B08,B09 in tray trolley, replacement](#)

H5.2.3.2 Sensor B08, B09 misalignment

1. Check sensor(s)

- Check adjustment of the sensor(s), see [H6.10 Light sensor B08, B09, carrier detection adjustment](#)

H5.2.4 Tray trolley, carrier de-select and storage problems

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H5.2.5 Tray trolley, general faults

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H5.2.6 Tray trolley, misalignment of the lift

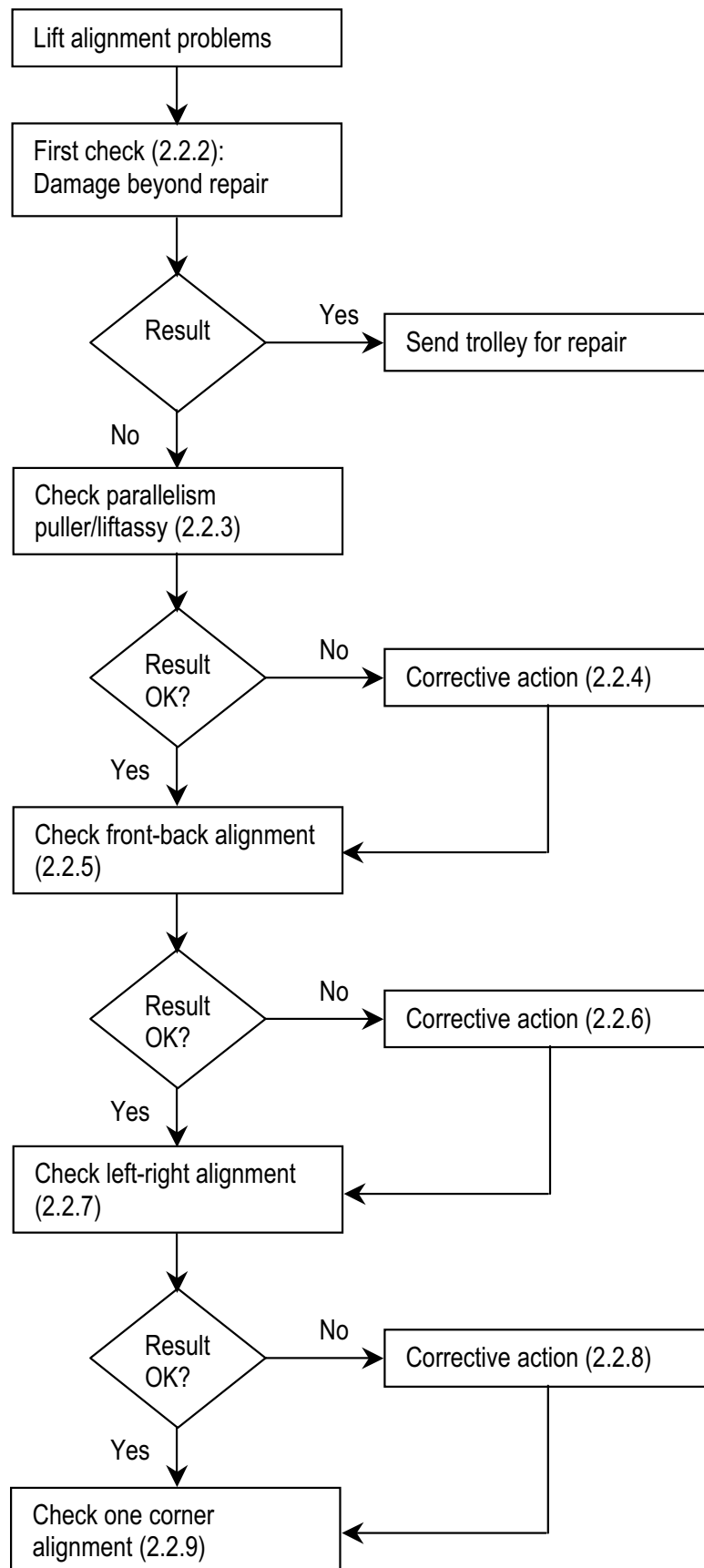


Figure 11

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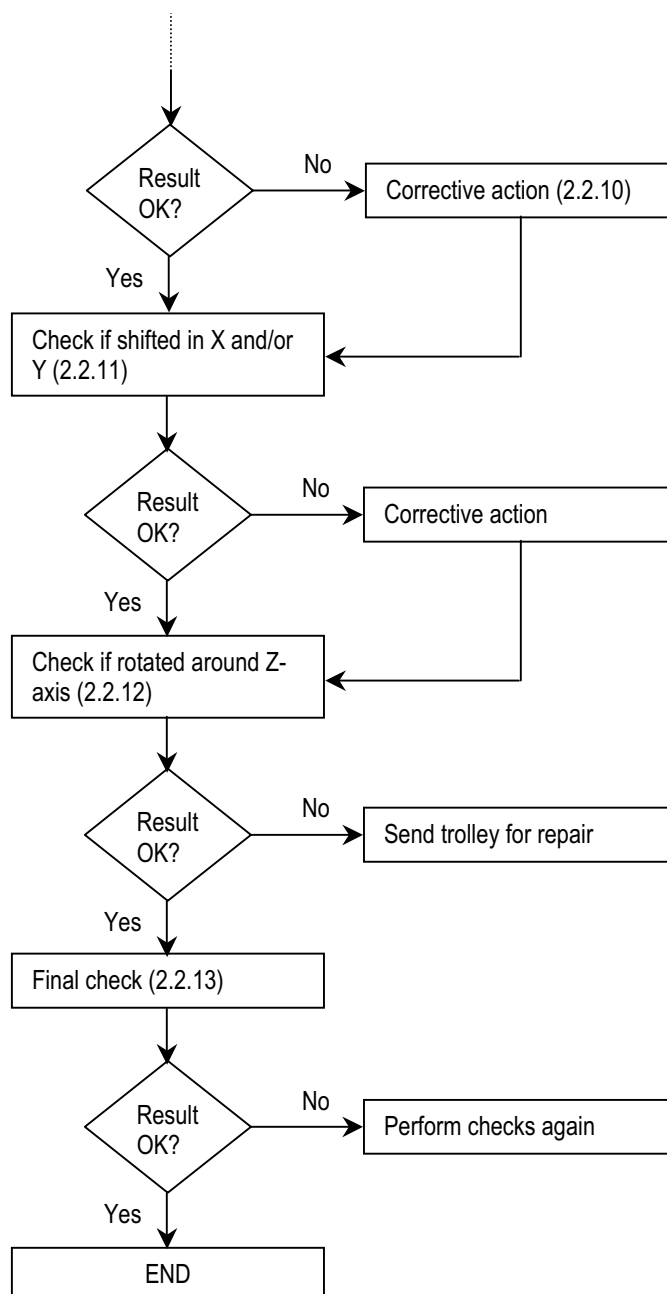


Figure 12

There are 5 different situations of misalignment of the lift (see Figure 4):

- 1.Front-back misalignment.
- 2.Left-right misalignment.
- 3.One-corner misalignment.
- 4.Shifted in x- or y-direction.
- 5.Rotated around the z-axis.

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1. First check

Note: To be sure that the lift-assembly, as it is hanging between the four tooth-belts, is not deformed or out of shape, a first check has to be done.

- Check if the 2 small strips on the front- and rear side of the lift-assy are not deformed (see Figure 5). If that is the case, the trolley has to be send back for repair.

2. Check parallelism between puller arm and lift assy

Note: The puller-tip movement area has to be parallel to the tray-carrier area. This is the plane between the two side guides:

- Remove the puller timing belt, see [H8.7 Vertical timing belt in tray trolley, replacement](#) in order to freely move the puller arm to the four corners.
- Use tool 4022 5320 737.0 "adjusting jig puller".
- Move the puller-arm manually to each of the four corners and measure the distance between upper side of guiding surface and topside of puller-arm (not the tip). This should be in all four corners $1.2\text{mm} \pm 0.1\text{mm}$.

3. Correction

- Adjustment is done by loosen the side guides and adjust as much as necessary (see Figure 7).

4. Replace the puller timing belt

- Therefore move the puller arm in the situation as on the photo on page 1. Check if the snap-in mechanism is in the hook-position, according to the manual page 7-67 table 7.15.
- NOTE "Lock" is same as "hook" position.
"The distance "D" between spindle lever and housing should be approximately 22mm (see page 7-71 figure 7-37). When rotating the spindle counter clockwise, the lever is moving towards the snap-in motor. Within 180° rotation the encoder should find its index pulse (zero fine).
"The puller-timing belt can now be replaced. Tension should be 300 ± 40 Hz

"Check if the tip of the puller-arm is moving parallel to the carrier guide of the lift, according to manual page 7-68, table 7-16.

NOTE

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"If this is not the case, adjust the big pulley by slightly loosen the 2 bolts on top of the puller assembly (see page 7-72 figure 7-38) and rotate the wheel.

5. Front-back misalignment

- When the lift is tilting the driving belt of the lift-motor is lifted over his teeth (see Figure 8). This can be caused by a component jammed between the belt and the pulley or when the tension on the belt is not enough.
- Check lift straightness compared to the trolley frame using two strips. First check straightness of the counterweights

6. Correction

- Make sure that the belt and timing belt pulleys are marked (see Figure 10). Check which side (front- or rear-side) is shifted. Loosen the tension of the drive belt of the lift-motor by releasing the belt tension pulley (see Figure 9) and rotate the axle of the vertical lift-movement of the front or rear-side, without moving the drive belt. The teeth of the belt have to be shifted over the pulley.

7. Left-right misalignment

- Check lift straightness compared to the trolley frame using two strips. Then raise lift to upper position and measure the four corners. These values have to be the same.
- Very small adjustment can be done by slightly loosen the three bolts of the small metal strip on front or rear-side wherewith the lift-plate is mounted between the vertical timing belts see Figure 11.
- When there is a large misalignment it is caused by the shifting of the vertical timing belts over their pulleys.

8. Correction

- "Loosen the tension of the vertical timing belts by releasing the upper strip where the timing belt pulleys are mounted (see Figure 12). Loosen the two bolts.
- "Shift the timing belt one or two tooth over its timing belt pulley, to adjust the lift
- "Adjust the vertical lift belt tension according to figure 7.76 in the manual on page 7-125.

9. One Corner misalignment

- Small misalignment can be adjusted by slightly loosen the three bolts of the small metal strip on front or rear-side wherewith the lift-plate is mounted between the vertical timing belts. See Figure 11.
- When there is a large misalignment it is caused by the shifting over the vertical timing belts over their pulleys.

10. Correction

- According to the description on page 3, but now just adjust the timing belt pulley in one corner.

11. Shifted in X or Y direction

- Check position in comparison with a slot in storage area. If not in line, check for deformation of the small strips in front- or rear-side

H5-00005.fm

wherewith the liftplate is mounted between the vertical timing belts. See Figure 11 and Figure 13.

- There is a very small adjustment possible, but be very careful. With this adjustment the liftplate is not in the middle between the vertical lift belts.
- Small adjustment can be done by changing the length of the ball-joint screw (see Figure 13).

12. Rotated around the z-axis

- In this case the small metal strips must be deformed. It is better to replace the complete lift assembly.

13. Final check

- The lift assembly should be horizontal again and the contra-weights must be on equal heights.
- This can be checked by using the two suspension beams 4022 532 0549.0. Measure the distance from topside of the beam to the topside of the guiding rail. Compare this value on the four corners of the liftplate plate assy.

14. Finalize

- "Measure and adjust EPD puller tip in stock area and the zero coarse puller according to the description in the service manual, volume 1 page 7-78, table 7-18 and page 7-85, table 7-19.
- "Calibrate according to the description in the service manual in page 7-129.
- NOTE
- "Install jumper X44 to overwrite calibration data.

H5.3 Reference information

H5.3.1 Tray trolley controller, LED status check

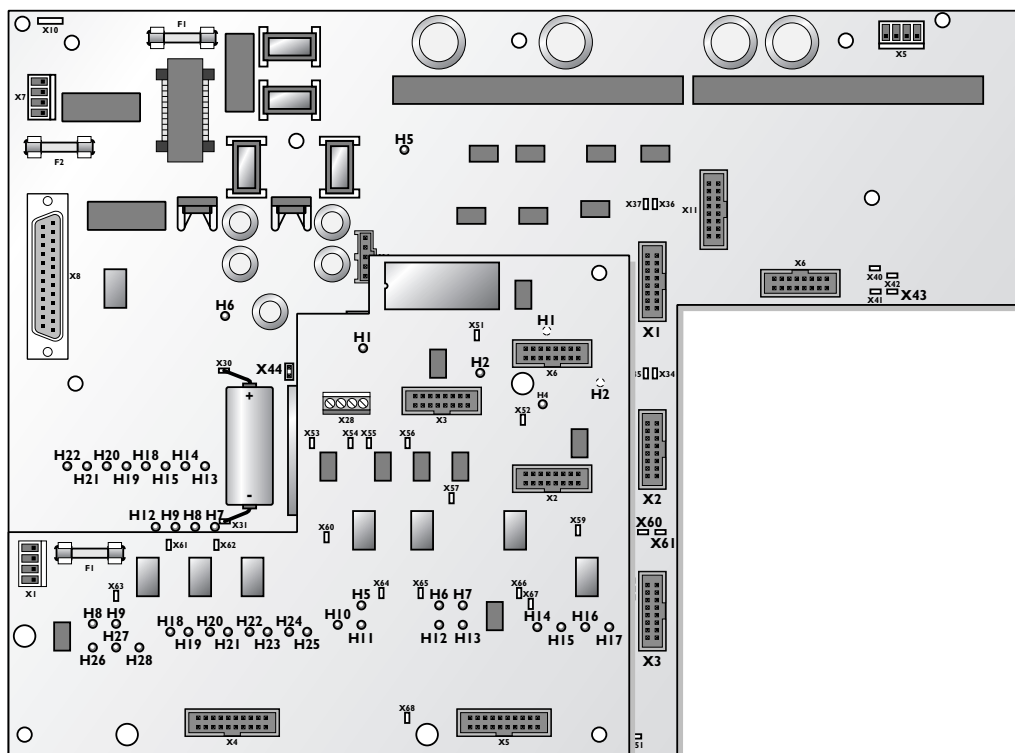


Figure 13 Tray trolley controller, LED status check

LED	ON/OFF	SYSTEM STATUS
H5	ON	24V supply < 16V (power failure)
H6	ON	Servo Power 45V ok.
H22	ON	Amplifier Index Puller
Operational state of the tray trolley		
H7	ON	Door closed
H8	ON	Lift in load/unload position
H9	ON	Zero course puller
H11	ON	Storage error rear
H13	ON	Zero course snap-in
H17	ON	Brake lift
H26	ON	Carrier at store position left (Hook pos.)
H27	ON	Carrier at store position right (Eject pos.)
H28	ON	Puller in stock area

Figure 14 Tray trolley controller, LED status check

H5.3.2 Tray trolley controller, connections

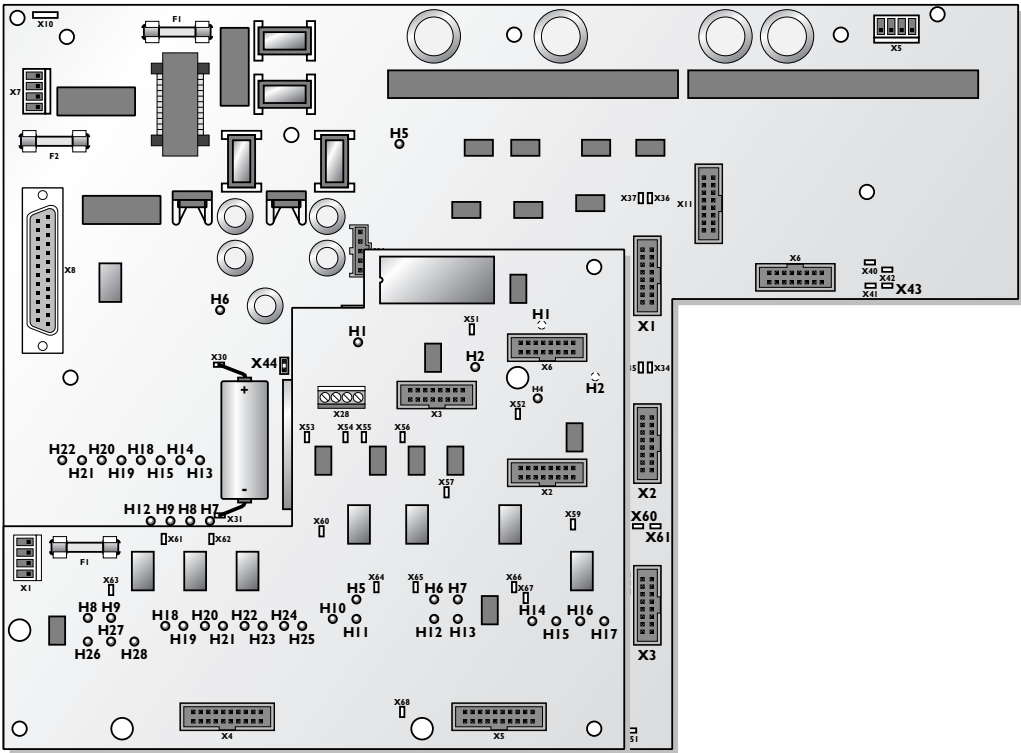


Figure 15 Tray trolley controller, connections

Connections	Item	Function
F1	Fuse 45V/4A	Servo power
F2	Fuse 24V/2A	Board power supply
X1	Connector	Servo puller
X2	Connector	Servo snap-in
X5	Connector	Motor lift
X7	Connector	Power input
X8	Connector	Bitbus communication
X100	Connector	Control panel
Connections upper board (Piggyback)		
X1	Connector	Power Input
X2	Connector	Encoder lift
X4	Connector	I/O puller
X5	Connector	I/O lift

Figure 16 Tray trolley controller, connections

H5-00003.fm

H5.3.3 Tray trolley, sensors and switches, overview

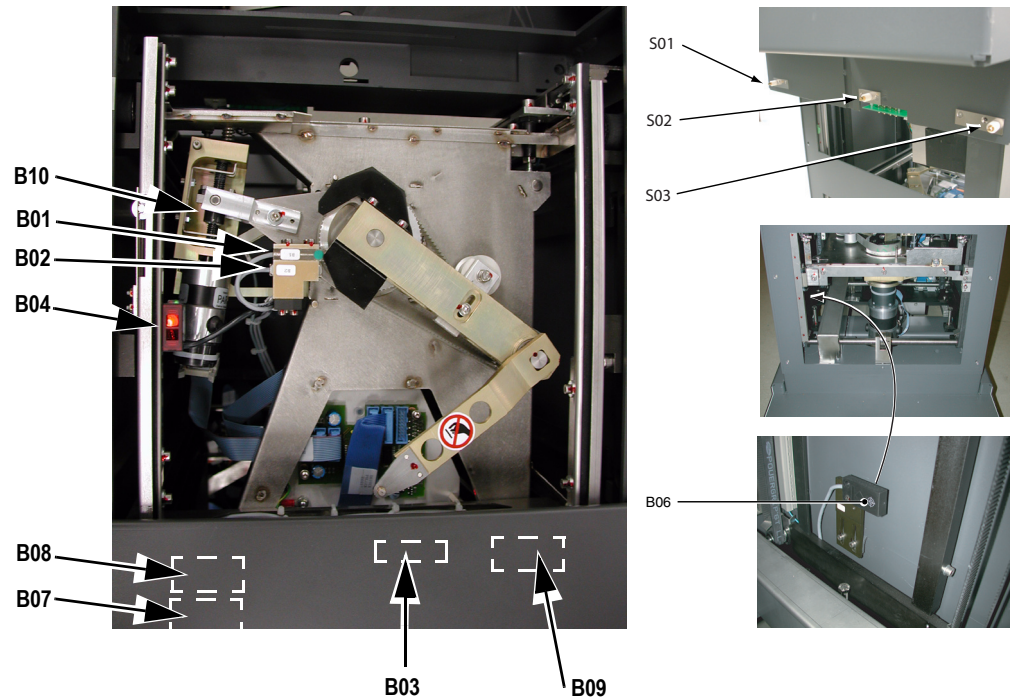


Figure 17 Tray trolley, sensors and switches, location

Sensor	Type	Description
S01, S02, S03	Sliding contacts	Trolley in lift position
B01	Epd-sensor	Puller in stock area. The sensor is activated when the puller arm is in the stock area. A vane activates the sensor. When the puller arm is in stock area, the vane is above the sensor.
B02	Epd-sensor	Zero-coarse puller. This sensor is activated when the puller arm is in the pick area. The sensor activates when the vane is above the sensor.
B03	Light-sensor	Carrier safe on lift. When the sensor is not activate and the B04 is activated, it means that a carrier is not in a safe position on the lift at the side of the pick position.
B04	Light-sensor	Carrier in lift. The sensor is activated when a carrier is present in the lift.
B05	Laser	Storage sensor front. When the laser beam is interrupted it means that a carrier is not in a correct position in the storage area. This will not allow the puller to place a carrier in the storage area.
B06	Epd-sensor	Zero-coarse lift. The sensor makes sure that, during start-up, the lift is in a safe position to home the puller-arm. The sensor is activated by the counter weight.
B07	Laser	Storage sensor rear. When the laser beam is interrupted it means that a carrier is not in a correct position in the storage area. This will not allow the lift to move up or down.
B08	Light-sensor	Tray in eject position. This sensor is activated when a carrier is in the eject position.
B09	Light-sensor	Tray in hook position. This sensor is activated when a carrier is in the hook position. When both sensors B08 & B09 don't detect a carrier, the stock position is considered empty, otherwise not empty.
B10	Epd-sensor	Zero-coarse snap-in. The sensor indicates the zero-coarse during the homing procedure.

H5-00003.fm

Figure 18 Tray trolley, sensors and switches, overview

H5.4 Diagrams

H5.4.1 Tray trolley, diagram

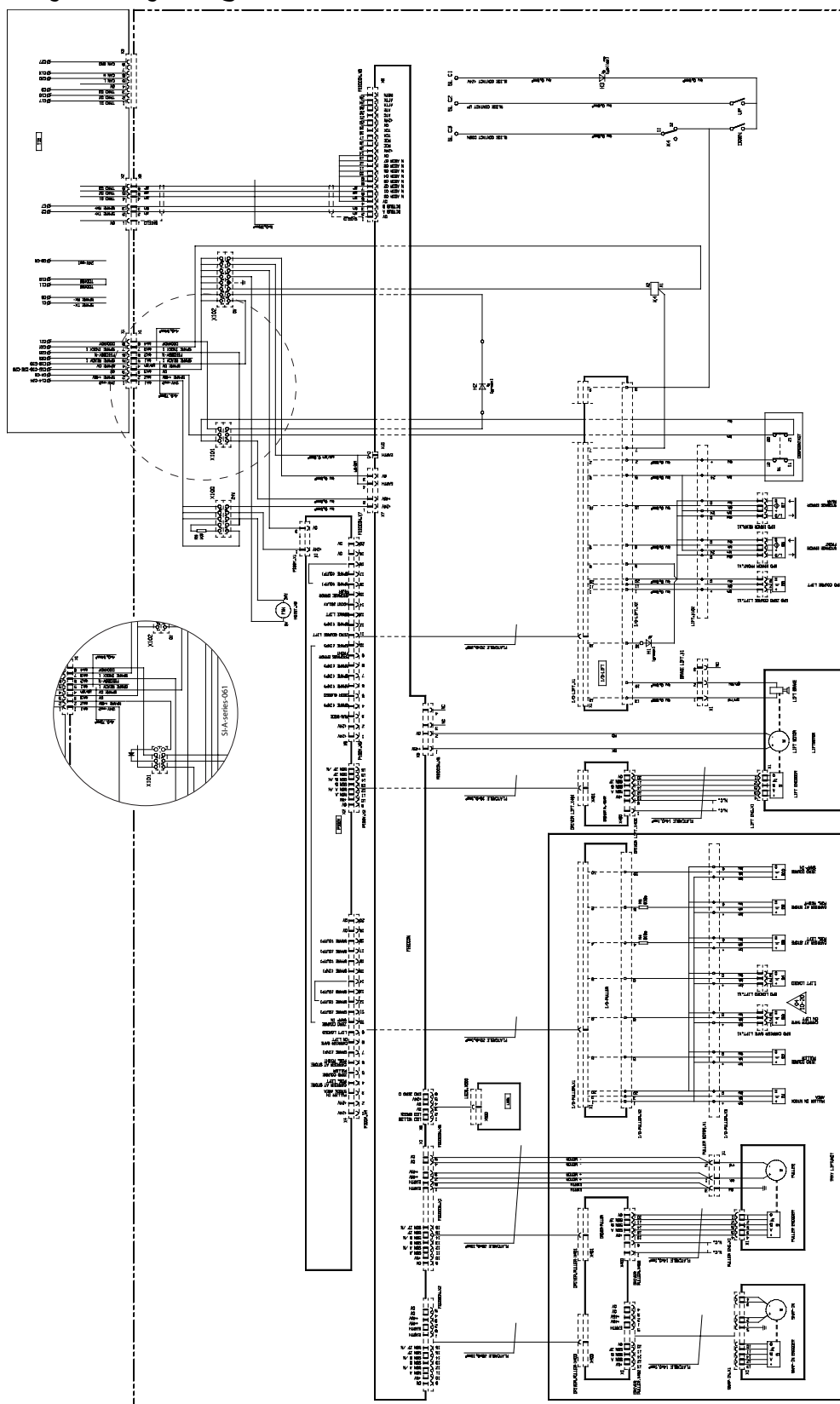


Figure 19 Tray trolley, diagram

H5-00004.fm

H5-00004.fm

CHAPTER H6 Measurement, adjustment and calibration

Only a regional service engineer is allowed to remove a sealed bolt. After replacing the bolt, it needs to be sealed again. Therefore Loctite 7400 coating is required. In general, when a sealed bolt has been replaced it needs re-adjustment.

H6-00001.fm

H6.1 Tray trolley, height adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)



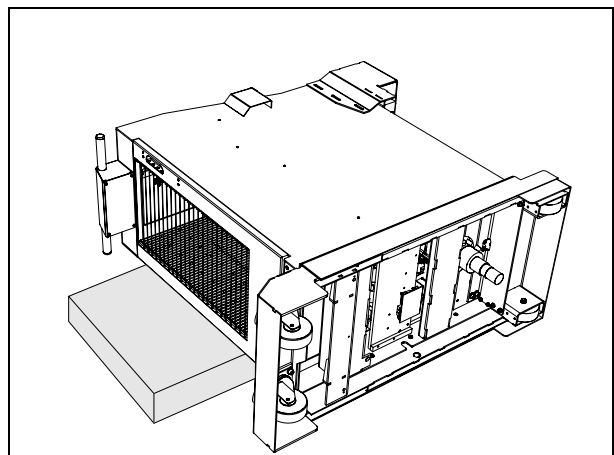
NOTE: This procedure applies when changing the board transport height from SMEMA range to JIS range, or vice versa.

CAUTION

HEAVY OBJECT (± 200 kg)
Improper lifting method may cause injury.
Use 3 persons to lift the object.

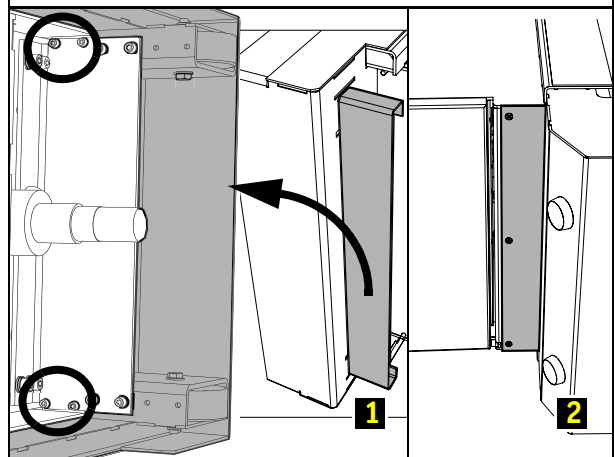
1. Prerequisites

- Place the tray trolley on its side on a pallet cart or on two wooden bars (prepare the surface so the that the trolley doesn't get scratched).



2. Remove cover strips when changing from SMEMA to JIS

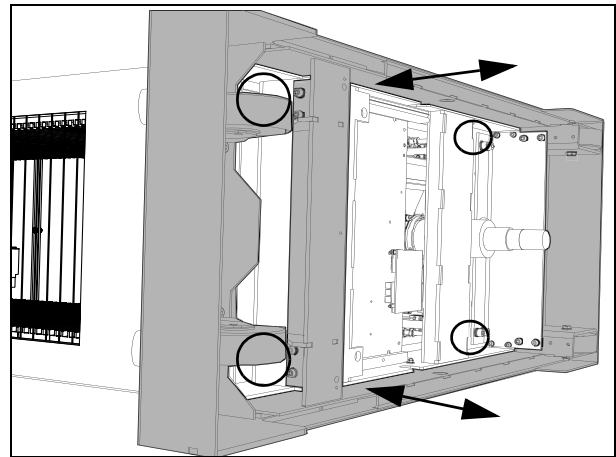
- Remove cover strip rear (1) (4x M6 bolt from inside).
- Remove cover strip front (2).



H6-00002.fm

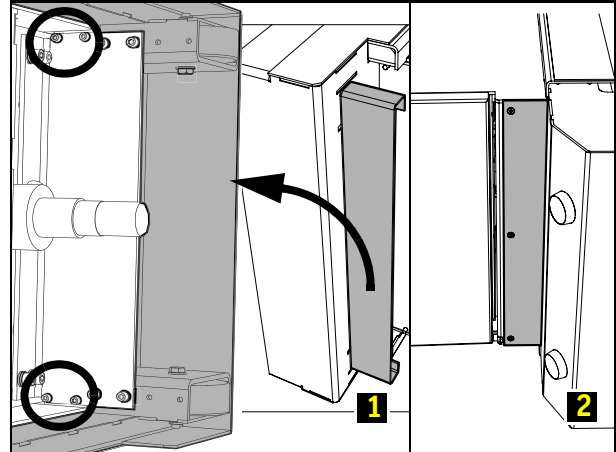
3. Adjust the trolley height

- Loosen frame fixing bolts front (4x) and rear (4x) and remove them.
- Slide wheel frame to required position.
- Replace the 8 bolts and tighten them.



4. Install cover strips when changing from JIS to SMEMA

- Install cover strip rear (1) (4x M6 bolt from inside).
- Install cover strip front (2).



5. Finalize

- Place the trolley upright again.

Note: After changing trolley to JIS height:
Store both cover strips so they can be used again when trolley needs to be set to Smema height.

H6.2 Tray trolley, connecting with extension cable

Estimated time to complete [min.]:

Required special tools.

Required part(s)

WARNING: Before removing or adjusting system components, operate correct shut-down procedures and switch off the feeder power supply

CAUTION: To avoid component damage by ESD, connect body mass to an ESD point before starting maintenance on the placement system or the tray trolley

1. Prerequisites

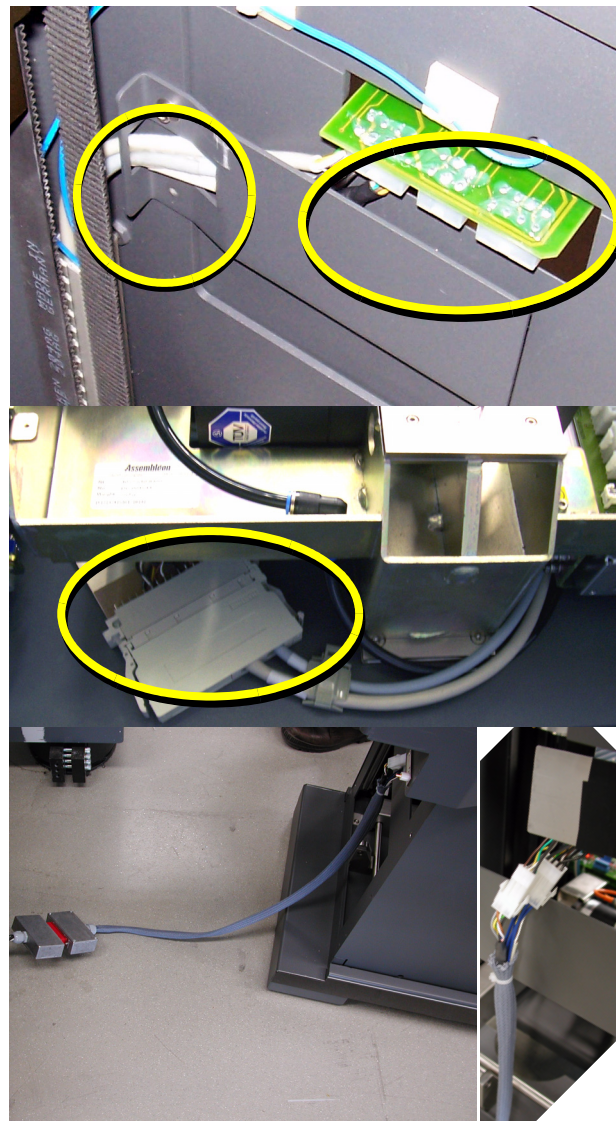
- Remove the tray trolley and power down the machine.

2. Connecting the extension cable

- Remove the metal cable protection plate, by loosening the two bolts
- Disconnect the two connectors.
- Note their position before disconnecting to prevent wrong reconnection later.
- Connect the two connectors of the extension cable to the tray trolley.
- Remount the metal cable protection plate, to prevent cable damage during calibration.

3. Connect second part of extension cable

- Disconnect the grey connector behind the tray trolley lift
- Connect the second part of the extension cable to the grey connector on the base.
- Connect the two parts of the extension cable (plug in the two red connectors)



H6-00007.fm

H6.3 EPD B01 puller in stock area, adjustment

Estimated time to complete [min.]:

Required special tools.

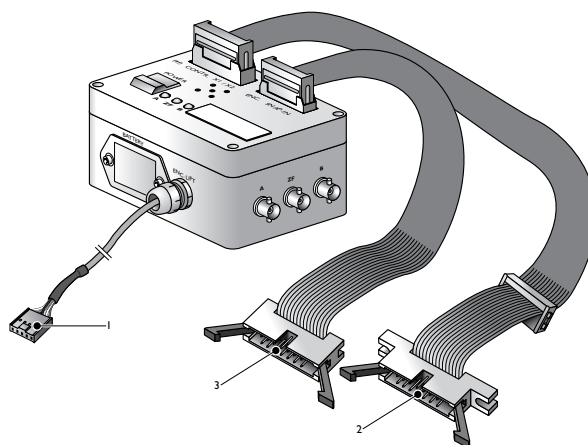
Required part(s)

1. Prerequisites

- Power down the machine.
- Connect the tray trolley to the machine with the extension cable, see [H6.2 Tray trolley, connecting with extension cable](#)
The trolley must be in the lower position.
Use wooden beams to support the trolley.

2. Connecting the encoder tester to puller motor encoder

- Remove puller motor encoder cable and connect encoder tester (1).
- Make sure that the cam of the connector is facing the motor.
- Power up the machine.
- Switch on the placement system.



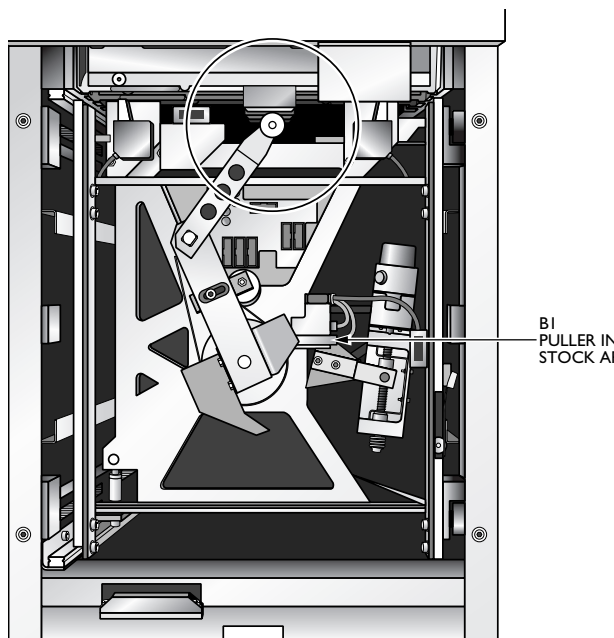
3. Release the lift motor brake

- Use an external power supply to the motor brake.
- Disconnect the lift motor brake connector X1 and apply 24 V between pin 1 (+ve) and pin 2 (-ve) on the motor side, to release the brake of the lift motor and re-connect X1 after adjustment (polarity sensitive).

4. Adjust

Note: The new extension cable has a 24V connection.

- Install the 20 mm adjustment ring at the puller catch pin.
- Put a carrier in position 23 and place the lift in front of position 23.
- The carrier must be in the 'hook' position.
- The 'lock' position can be found by rotating the spindle clockwise (2 in 21) until the first index puls after activating the zero coarse EPD (LED H13). The index puls can be read from the encoder tester.
- Push the puller arm with the ring carefully against the carrier which is in 'hooked' position (position 23).
- Check that the EPD 'puller in stock area (B1)' is just active (distance between EPD and metal vane is 0.5mm +/- 0.2mm). LED H28 at the tray trolley controller piggy board lights up when active.
- If necessary, adjust by moving the sensor B1. When it is just active, tighten the sensor bolts.



5. Finalize

- Calibrate the tray trolley, see [H6.20 Tray trolley, calibrating](#) .

H6.4 EPD B02, puller safe / puller zero coarse adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

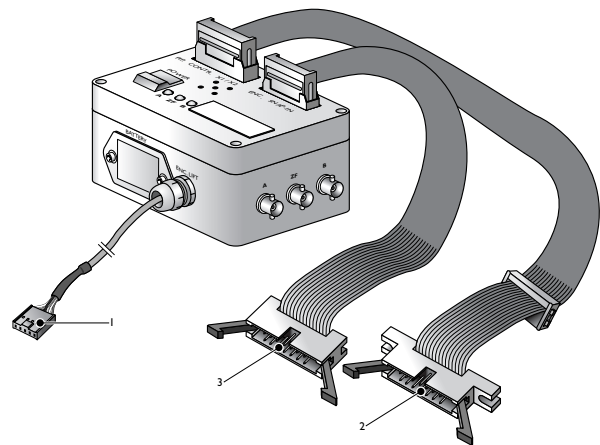
WARNING: Make sure the puller arm tip is in the middle of the lift (in a safe position!) when moving the lift up or down!

1. Prerequisites

- Power down the machine.
- Connect the tray trolley to the machine with the extension cable, see [H6.2 Tray trolley, connecting with extension cable](#)
- Trolley must be in the lower position.
Use wooden beams to support the trolley.

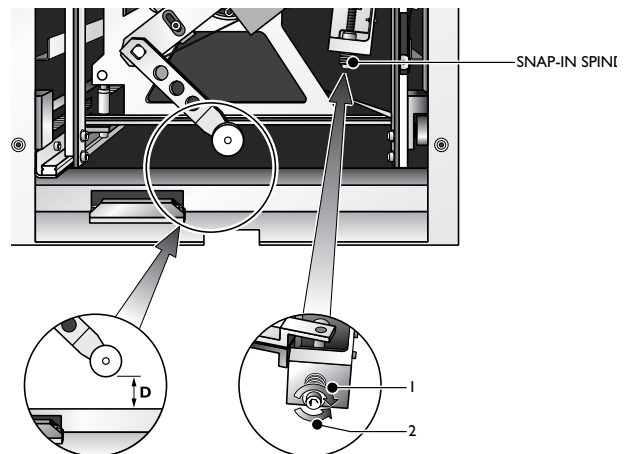
2. Connecting the encoder tester to puller motor encoder

- Remove puller motor encoder cable and connect encoder tester (1).
- Make sure that the cam of the connector is facing the motor.
- Power up the machine.



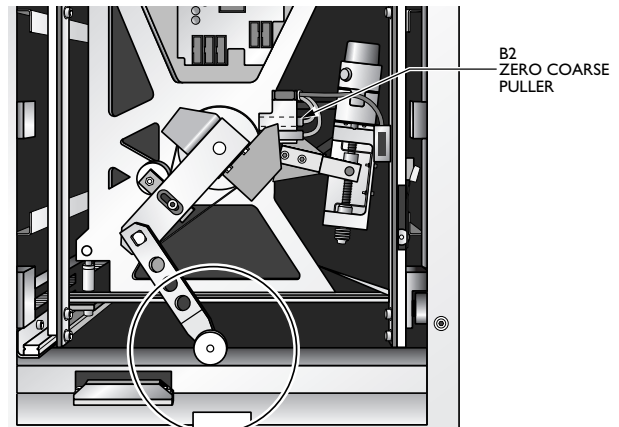
3. Check

- Push the lift to carrier position 13, turn snap-in to the 'lock' position (2 in 23) by rotating the spindle clockwise until the first index pulse after activating the zero coarse EPD (LED H13). The index pulse can be read from the encoder tester.
- Push the puller arm tip carefully against the rear cover of the frame (without the adjustment ring!).
- Move the puller arm inwards until the EPD (B2 in 24) is just active/out (switch moment) (LED H9) (distance between plate and EPD = $0.5 \pm 0.2\text{mm}$). The distance between the puller arm tip and the rear cover must be $10 \pm 1\text{mm}$. Install the 20mm adjustment ring (see chapter 12.29) to check this distance.
- If the distance is NOT 10mm, it must be adjusted.



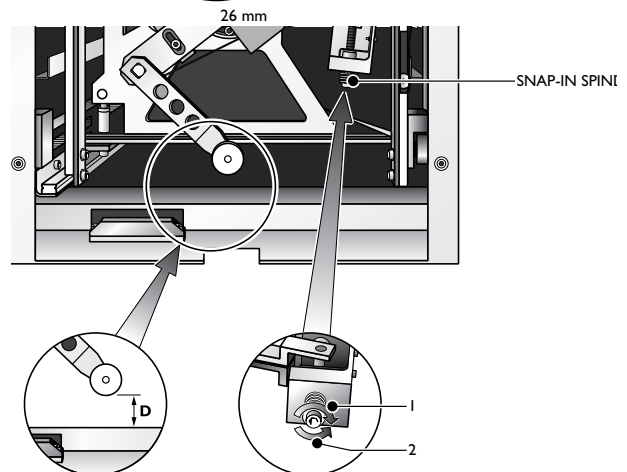
4. Adjust 1

- Install the 20mm adjustment ring.
- Push the puller arm tip carefully against the rear cover of the frame.
- Move the zero coarse puller EPD (B2) inwards until the EPD is just active (LED H9).
- Check the distance again by following the steps above.



5. Adjust 2

- Switch off the power.
- Connect the encoder tester to the puller motor encoder with the cam (see FIGURE 8A-52) facing the motor. Reconnect snap-in encoder cable.
- Switch the power on again.
- Move the puller arm inward to check if the zero fine signal is present. Distance 'D' must be between 12 - 36mm.
- Switch off the power.
- Disconnect the encoder tester and reconnect the encoder cable.



6. Finalize

- Calibrate the tray trolley, see [H6.20 Tray trolley, calibrating](#)

H6.5 Tray carrier sensor B03, B04 adjustment

Estimated time to complete [min.]:

Required special tools.

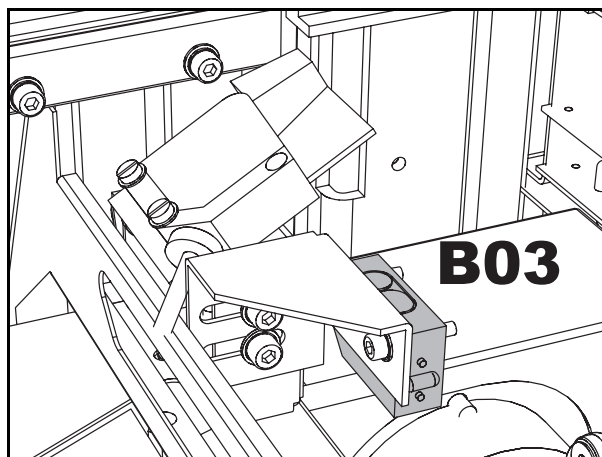
Required part(s)

1. Prerequisites

-
-

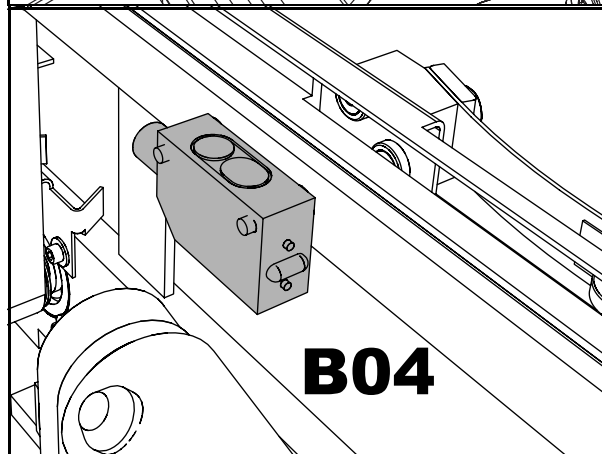
2. Distance threshold adjustment sensor B03, B04

- Place a tray carrier **on top of** the guides.
- Turn the adjustment screw until the orange LED turns off.
- Check if a tray placed **in** the guides will be recognized.
- Secure the adjustment screws with sealing wax.



3. Sensor position, sensor B03 only

- Put a tray carrier in the lift unit with the puller in the lift position.
- The sensor must recognize the tray carrier.
- Position the sensor in such a way that, when sliding the tray carrier 2 mm in the pick direction, the sensor turns off.
- Check the adjustment with the TIP tools.



H6.6 Laser B05, sensor storage in tray trolley, adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)



LASER BEAM

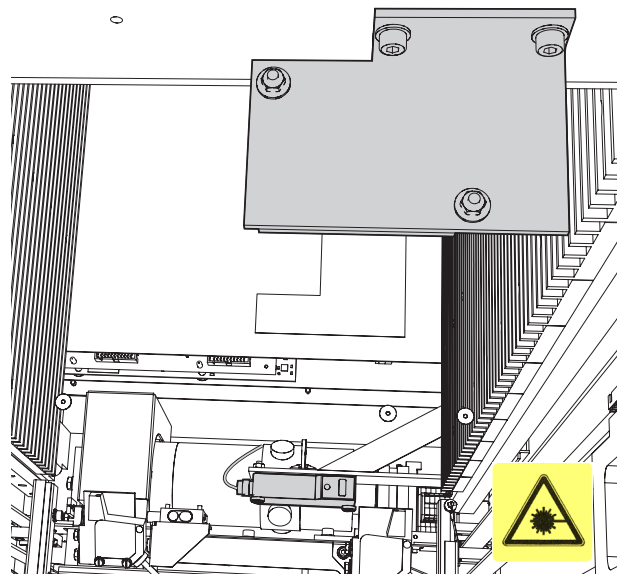
Looking into it may injure your eyes.
Do not stare into it

1. Prerequisites

-
-

2. Adjusting laser B05

- Move the adjustment carrier from slot 45 to slot 40.
- If the rear laser beam does not cause the yellow LED to illuminate, adjust the laser with the two screws in the middle of the tray trolley.
- Adjust the reflector until the largest reflected laser beam is centered around the hole of the adjustment carrier.
- Remove the adjustment carrier from slot 1 and replace it with a regular carrier.
- Move the regular carrier 2 mm outside the door.
- Adjust the laser intensity until the LED illuminates.



H6-00021.fm

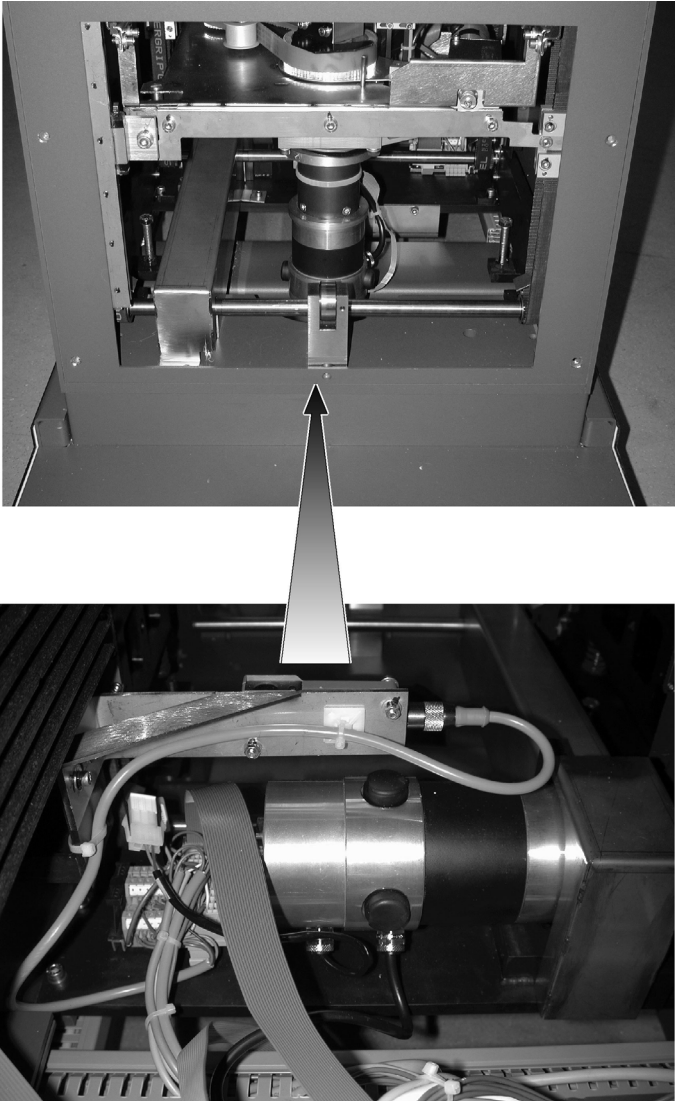


Figure 20 Laser sensor storage adjustment - Rear

H6-00021.fm

H6.7 EPD B06 in tray trolley, adjustment

Estimated time to complete [min.]: ?

Required special tools. ?

Required part(s) ?



NOTE: The sensor can be mounted in two ways on the tray trolley depending on the status of the trolley. It can either be pointing with the LED up or with the LED pointing towards the storage area. Adjustment of the sensor stays the same.

1. Prerequisites

- Connect the trolley to the machine, see [H6.2 Tray trolley, connecting with extension cable](#)

2. Check function of EPD (B06)

- In the highest position (with the counterweights against the end stops) the sensor must be activated.

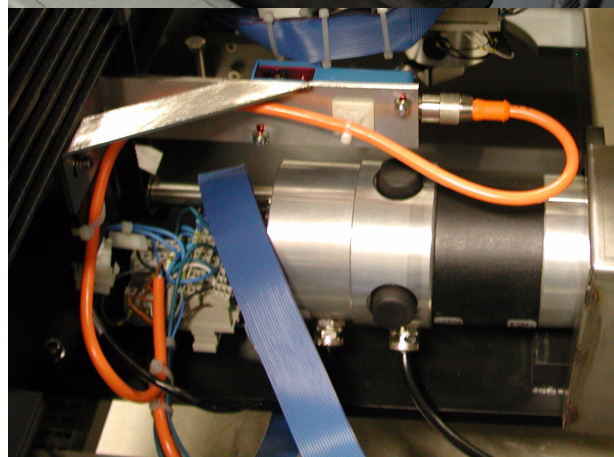
Note: To check this there is a small LED (1?) on the sensor.



3. Release lift motor brake

- Release the lift motor brake with an external power supply to the motor brake.
- Disconnect the lift motor brake connector X1 and apply external power supply of 24 V between pin 1 (+ve) and pin 2 (-ve) on the motor side, to release the brake of the lift motor and re-connect X1 after adjustment (polarity sensitive).

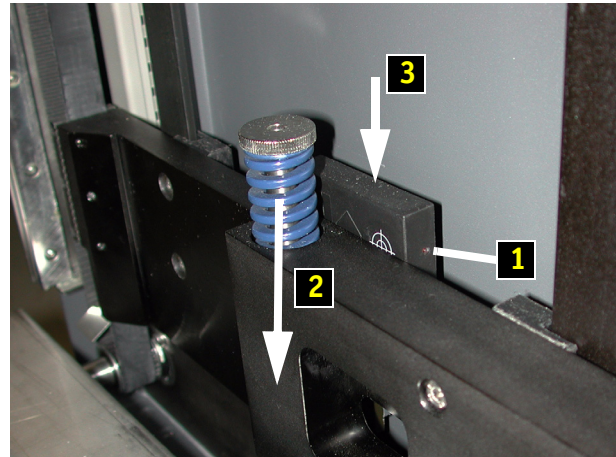
Note: The standard extension cable has a 24V connection.



H6-00003.fm

4. Adjust EPD (B06)

- Loosen the bracket bolts of the lift zero coarse EPD.
- Move the lift counter weight completely down against its end stop (2). (The lift is now up.)
- Check when the sensor (1) is just activated.
- Move bracket with sensor until sensor is just activated (3).
- Hand-tighten one screw.
- Mark this position on the side of the trolley frame with a marker pen.
- Move the sensor 2mm below the mark and tighten the bracket with sensor.



H6.8 Tray trolley lift, checking the offset between the lift EPD (B06) and the lift motor encoder zero fine

Estimated time to complete [min.]:

Required special tools.

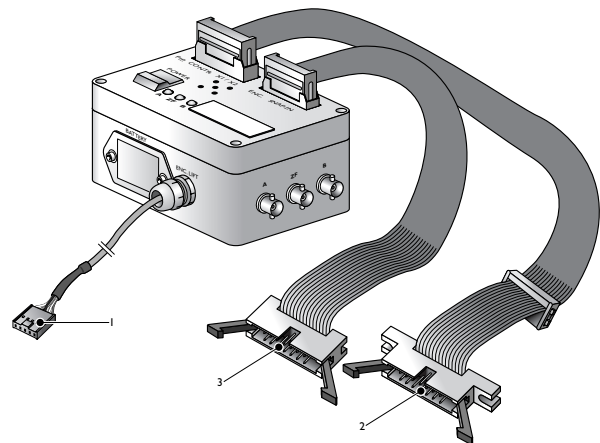
Required part(s) Encoder tester

1. Prerequisites

- Connect the tray trolley to the machine with the extension cable [H6.2 Tray trolley, connecting with extension cable](#)
- Power up the machine.
- The trolley must be in the lower position (use wooden beams to support the trolley).
- Move the lift manually to its highest position.
- Power down the machine.
- Slide the tray trolley controller cabinet out of the trolley, see [2. Remove tray trolley controller cabinet](#)

2. Connecting the encoder tester to lift motor encoder

- Remove lift encoder cable and connect encoder tester (1).
- Power up the machine.



3. Release lift motor brake

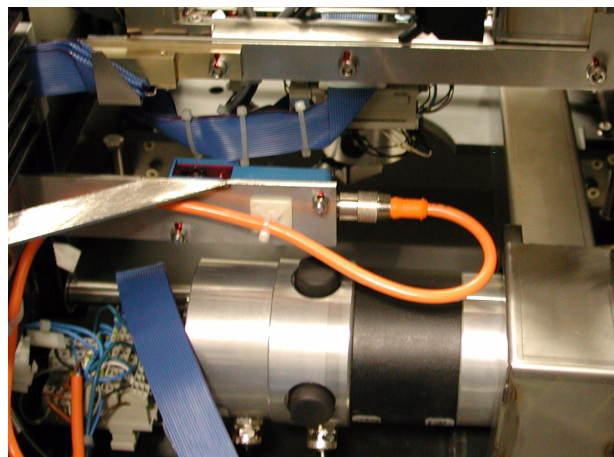
- Release the lift motor brake with an external power supply to the motor brake.
- Disconnect the lift motor brake connector X1 and apply external power supply of 24 V between pin 1 (+ve) and pin 2 (-ve) on the motor side, to release the brake of the lift motor and re-connect X1 after adjustment (polarity sensitive).

Note: The new extension cable has a 24V connection.

4. Encoder check

Note: The zero fine signal may only be present once in the active range of the EPD. It must also be at least a quarter of a lift motor rotation away from the EPD-activation point.

- Move the lift downwards manually and check that the zero fine signal is present only once.
- If the signal is present more than once, re-adjustment is necessary:

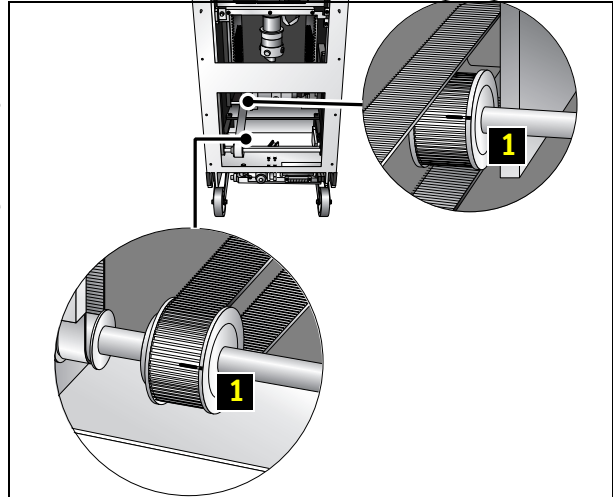


H6-00004.fm

5. Marking the drive belt

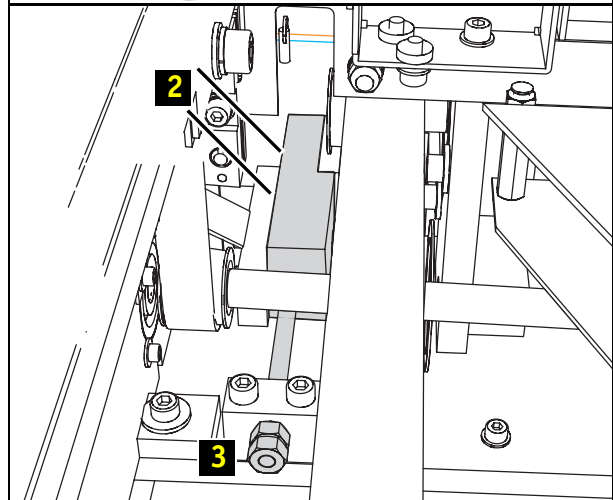
- Remove the belt cover.
- Move the lift in such a position that the markers (1) on the belts and timing belt pulleys are clearly visible.

Note: When no marks are available then mark both the belt and the timing belt pulley of both axes (front and rear) with an indelible marker pen.



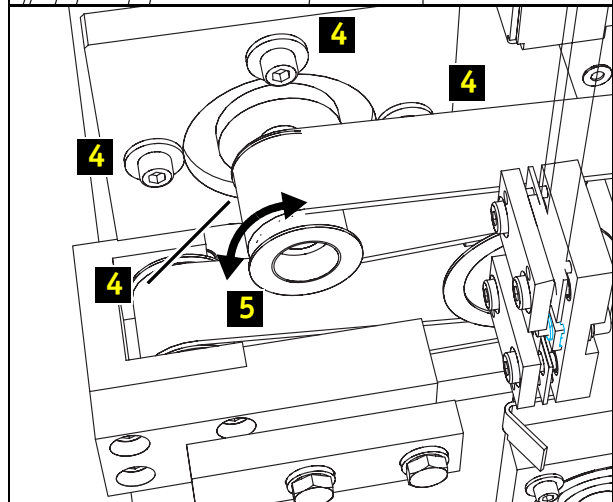
6. Slacken the drive belt

- Loosen the two lock bolts (2).
- Loosen the lock nut (3) of the belt tension adjuster.
- Turn the belt tension adjuster (3) clockwise (outwards) until the belt tension block is completely slack.
- Mark the belt and timing belt pulley of the lift motor.



7. Adjust lift motor position

- Loosen the 4 motor fastening bolts (4) as far as possible so that the belt can be slipped off the motor and the motor shaft can be rotated.
- Rotate the motor shaft (5) as much as needed.
- Hand-tighten the motor fastening bolts and tighten the belt.
- check encoder, see step [4..Encoder check](#)
- Repeat the above procedure until the signal is present only once.



8. Finalize

- Tighten the bolts of the motor.
- Power down the machine.
- Remove the encoder tester and re-connect the encoder cable.
- Adjust the belt tension, see [H6.18 Drive belt of tray trolley lift, adjustment](#)
- Put the controller cabinet back in place.
- Put back the cover plate at the back of the tray trolley.
- Calibrate the tray trolley, see [H6.20 Tray trolley, calibrating](#).

H6-00004.fm

H6.9 Laser B07, sensor storage in tray trolley, adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

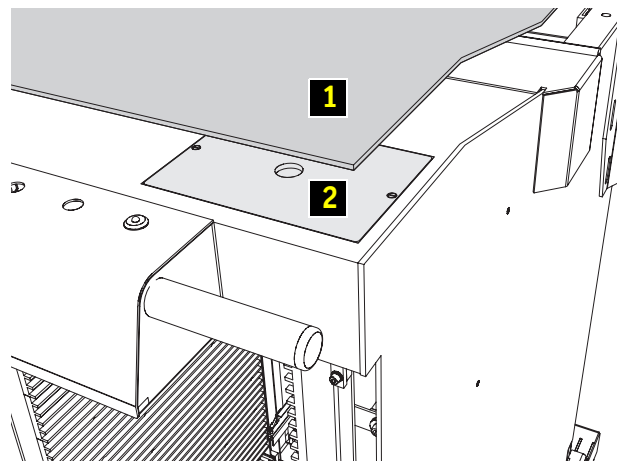


LASER BEAM

Looking into it may injure your eyes.
Do not stare into it

1. Prerequisites

- Remove covers (1,2).

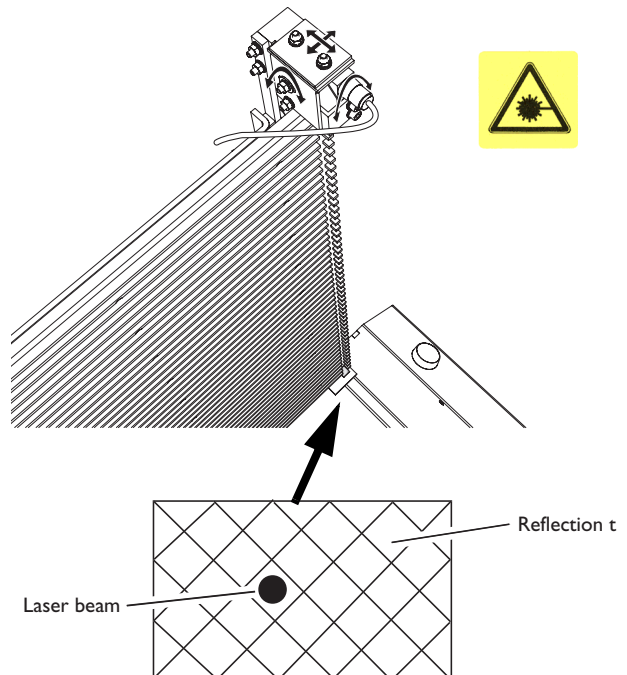


2. Adjustment of laser sensor front

Do not look into the laser beam.

The laser is a class II laser which can cause serious injury!

- Set the laser sensor to maximum intensity.
- Adjust the focus of the laser beam. The spot must be as small as possible at a distance of 590 mm (point to a wall).
- Install 2 adjustment carriers; one at slot 10, the other at slot 47. (Both in hook position).
- Adjust the laser beam until the beam passes both holes of the adjustment carriers. (Spot may be symmetrical around the hole).
- Tighten the bolts and verify if the beam still passes both holes. If not, re-adjust.
- Remove the carriers
- Align the reflector foil until the laser beam reflects within a square of the foil.



3. finalize

- Installation in reverse order.

H6-00011.fm

H6.10 Light sensor B08, B09, carrier detection adjustment

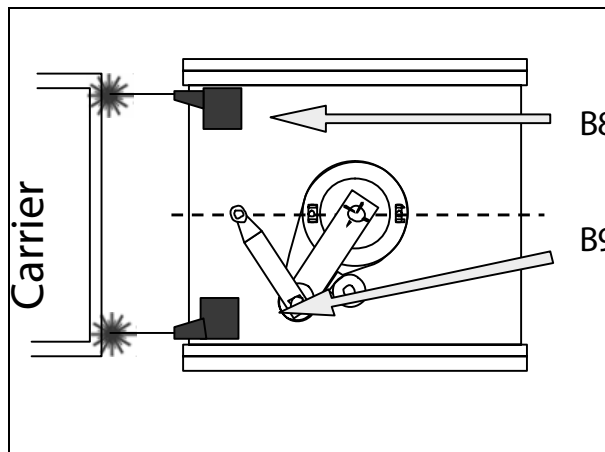
Estimated time to complete [min.]: -

Required special tools. -

Required part(s) -

1. Function of B08 and B09

- These sensors detect carrier presence in the store.
- A laser beam is send and detected by the same sensor.
- If no sensor is active, no carrier is present in the store position in front of the lift.
- If only sensor B08 is active, a carrier is pushed in the 'Eject' position.
- If B9 is active a carrier is present in 'Hook' position.



2. Adjust sensor B09

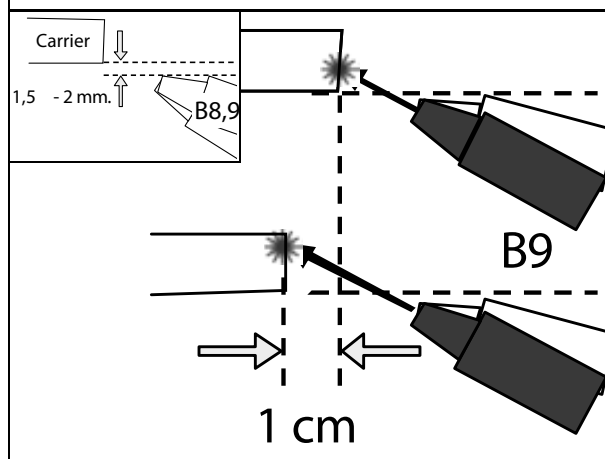
- Set lift on position 1 to 'Hook' the calibration carrier.
- Place calibration carrier in hook position.

Note: The center of the laser spot from B09 should on the center of the carrier, while remaining a distance of 1.5- 2 mm between sensor and carrier bottom.

- Adjust when required.

Note: This adjustment is difficult since both mechanical adjustments (distance to carrier bottom / position laser spot) influence each other and both need to be correct.

- Move carrier 1 cm from 'Hook' position outwards (to 'Eject' direction).
- Set distance adjustment on B09 that the status LED on the sensor is just off.



3. Adjust sensor B08

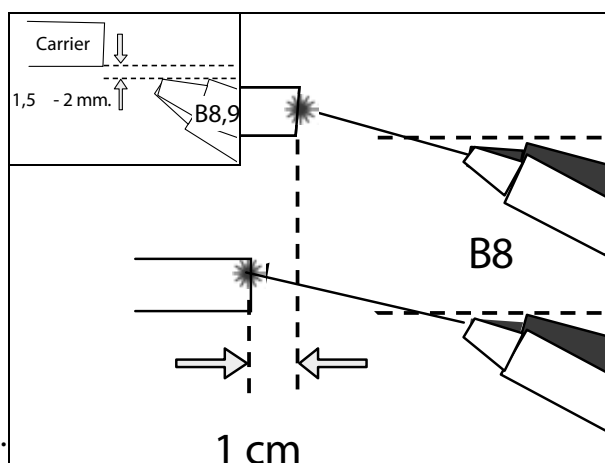
- Place calibration carrier in eject position.

Note: The center of the laser spot from B08 should on the center of the carrier, while remaining a distance of 1,5 – 2 mm. between sensor and carrier bottom.

- Adjust when required.

Note: This adjustment is difficult since both mechanical adjustments (distance to carrier bottom / position laser spot) influence each other and both need to be correct.

- Move carrier 1 cm from 'eject' position outwards.
- Set distance adjustment on B08 that the status LED on the sensor is just off.



H6-00008.fm

H6.11 Snap-in zero coarse EPD B10 adjustment for 'lock' position

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1. Prerequisites

- Power down the machine.

2. Adjusting

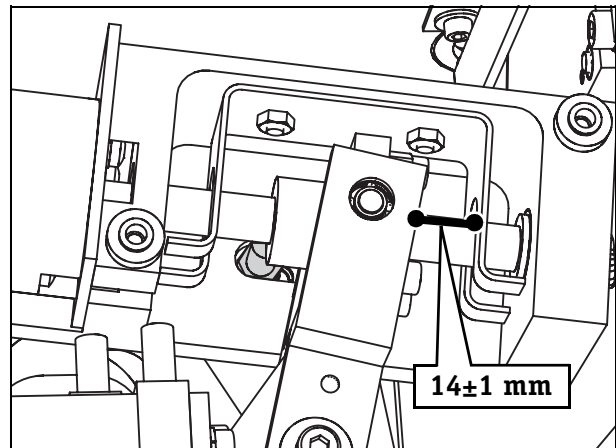
- Make sure that the distance at 'D' = $22^{+0,5}\text{mm}$ by rotating the snap-in spindle manually.

3. Connecting the encoder tester to snap-in encoder

- Remove snap-in encoder cable and connect encoder tester (?).
- Power up the machine.

4. Adjust

- Set distance between bracket and end-of-stroke spring as indicated.
- Within the tolerance given, the sensor should be switching.
- Rotate the spindle manually, counter clockwise (1 in FIGURE 8A-52) - seen from the front of the tray trolley - $D < 22\text{mm}$, until the first index puls.
- Mark the spindle and rotate the spindle 180 degrees clockwise (2 in FIGURE 8A-52) seen from the front of the tray trolley.
- Adjust the EPD (1 in FIGURE 8A-54) (LED H13 at the piggyback board) until it is just active. (Clearance of the EPD $0.5 \pm 0.2\text{mm}$.)
- Rotate the spindle clockwise (2 in FIGURE 8A-52, seen from the front of the tray trolley) until the first index puls after activating the zero coarse EPD.
- Check if the parallelism of the puller arm tip (see 8A.6.2.3.6) is within $0.4 \pm 0.2\text{ mm}$.



H6-00018.fm

H6.12 Puller catch pin parallelism adjustment

Estimated time to complete [min.]: ?

Required special tools. ?

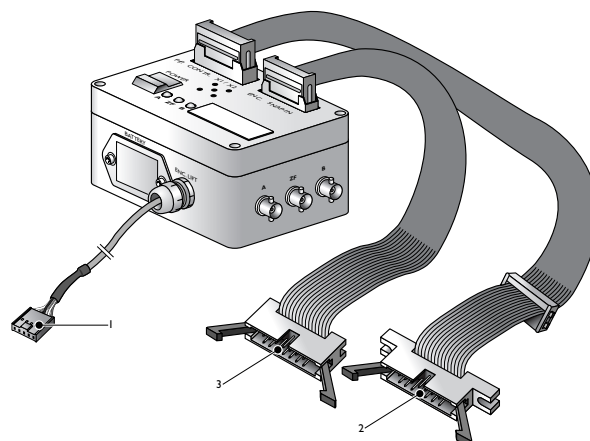
Required part(s) ?

1. Prerequisites

- Connect the tray trolley to the machine with the extension cable, see [H6.2 Tray trolley, connecting with extension cable](#)

2. Connecting the encoder tester to snap-in motor

- Power down the machine.
- Connect encoder tester (3).
- Power up the machine.



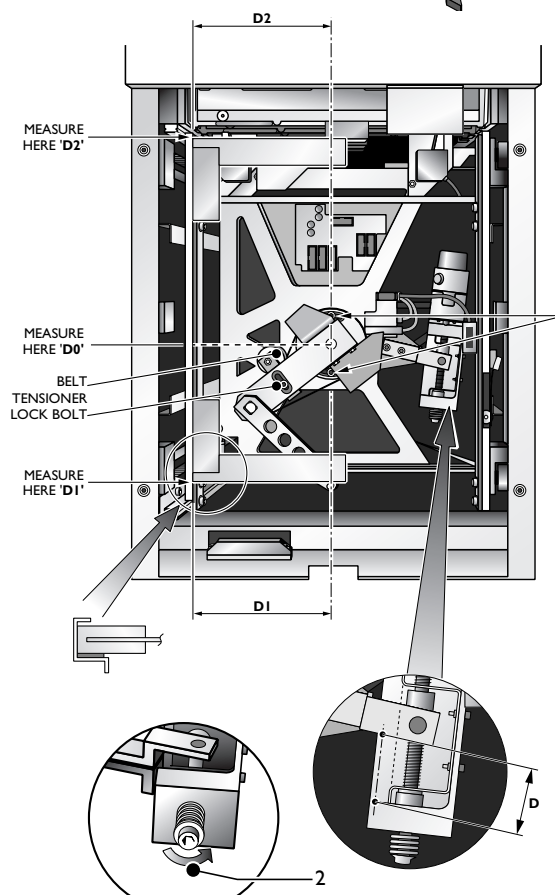
3. Check the parallelism of the puller catch pin with respect to the right guide rail

- Place a square hook or steel ruler between the guides.
- Ensure that the puller is in the lock position (snap-in) by rotating the spindle as indicated (2), until the first index puls after the zero coarse EPD is activated, see [H5.3.1 Tray trolley controller, LED status check](#), LED H13.

Note: The index pulse can be read from the encoder tester.

Note: During movement of the puller arm the position of the snap-in can change!

- Make sure the spindle of the snap-in motor does not rotate. The zero-fine position must stay in place.
- Measure the position of the puller catch pin at the middle position (D0).
- Measure the position of the puller catch pin at 'D1' and 'D2'. This should be 'D0' \pm 0.4 mm.
- Adjustment is done by slightly loosening the 2 bolts (1) and rotating the complete puller arm.
- Tighten all bolts.



4. Finalize

- Adjust the puller drive belt [H6.19 Puller motor timing belt, adjustment](#)
- Calibrate the tray trolley, see [H6.20 Tray trolley, calibrating](#).
- Power down the machine.
- Reconnect the encoder.

H6-00016.fm

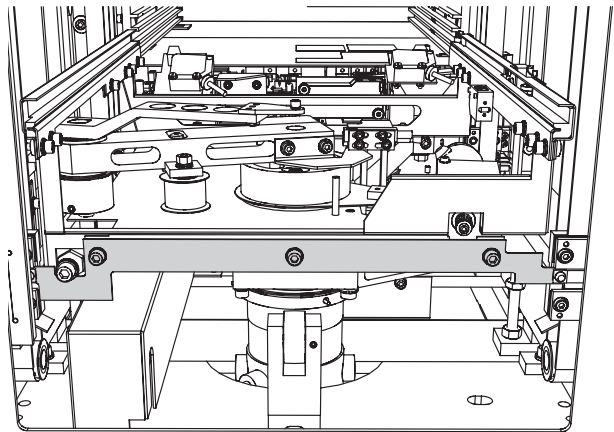
H6.13 Lift in tray trolley alignments

1. First check

- Check if the 2 small strips on the front- and rear side of the lift-assy are not deformed (see Figure 5).
- When deformed, the trolley has to be send back for repair.

2. How to repair the tray trolley in case of misalignment of the lift

- There are 5 different situations of misalignment of the lift:
 - * Front-back misalignment
 - * Left-right misalignment.
 - * One-corner misalignment.
 - * Shifted in x- or y-direction.
 - * Rotated around the z-axis.



H6.13.1 Parallelism between puller-arm and lift-assy, adjustment

Estimated time to complete [min.]: ?

Required special tools 4022 5320 737.0 "adjusting jig puller.

Required part(s) -

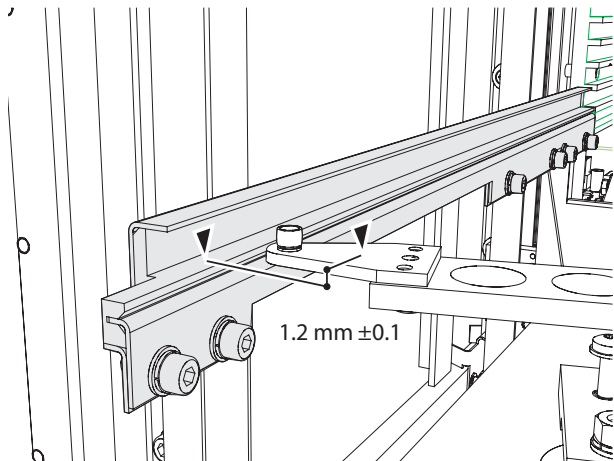
1. Prerequisites

- Slacken the puller motor timing belt ([H6.19 Puller motor timing belt, adjustment](#)) in order to freely move the puller arm to the four corners.

2. Check

The puller tip movement area has to be parallel to the tray carrier area. This is the plane between the two side guides.

- Use tool 4022 5320 737.0 "adjusting jig puller.
- Move the puller arm manually to each of the four corners and measure the distance between upper side of guiding surface and topside of puller arm (not the tip).
- This should be on all four corners $1.2\text{mm} \pm 0.1\text{mm}$.



H6-00017.fm

3. Adjustment

- Adjustment is done by loosen the side guides and adjust as much as necessary.

4. Finalize

- Adjust the puller motor timing belt, see [H6.19 Puller motor timing belt, adjustment](#)

H6.13.2 Front-back misalignment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1. Check

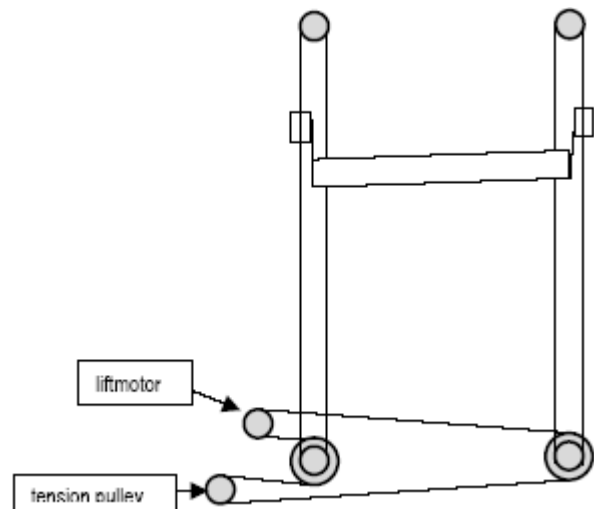
- When the lift is tilting the driving belt of the lift-motor is lifted over his teeth. This can be caused by a component jammed between the belt and the pulley or when the tension on the belt is not enough.
- Check lift straightness compared to the trolley frame using two strips. First check straightness of the counterweights.

2. Correction

- Make sure the belt and timing belt pulleys are marked (see Figure 10).
- Check which side (front- or rear-side) is shifted.
- Release belt, see [H6.18 Drive belt of tray trolley lift, adjustment](#)
- Rotate the axle of the vertical lift-movement of the front or rear-side, without moving the drive belt.
- The teeth of the belt have to be shifted over the pulley.

3. Finalize

- Adjust the timing belt, see [H6.18 Drive belt of tray trolley lift, adjustment](#)



H6-00017.fm

H6.13.3 Left-right misalignment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1. Check

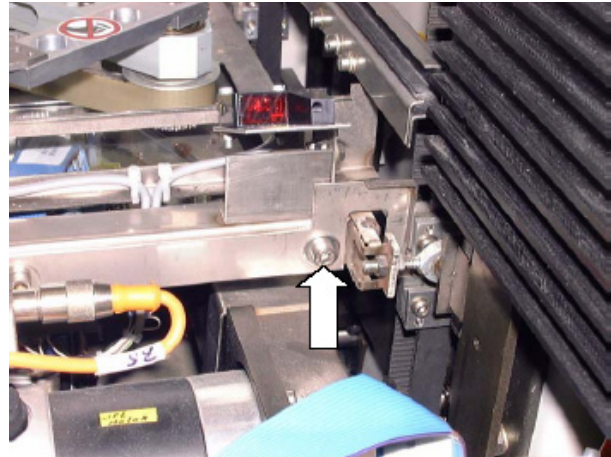
- Check lift straightness compared to the trolley frame using two strips. Then raise lift to upper position and measure the four corners. These values have to be the same.

2. Adjustment

- Very small adjustment can be done by slightly loosen the three bolts of the small metal strip on front or rear-side wherewith the lift-plate is mounted between the vertical timing belts.

3. Adjustment

- When there is a large misalignment it is caused by the shifting of the vertical timing belts over their pulleys.
- Release vertical lift belt, see [H6.17 Vertical lift belt, adjustment](#)
- Shift the timing belt one or two tooth over its timing belt pulley, to adjust the lift
- Adjust vertical lift belt, see [H6.17 Vertical lift belt, adjustment](#)



H6.13.4 One corner misalignment

Estimated time to complete [min.]:

Required special tools.

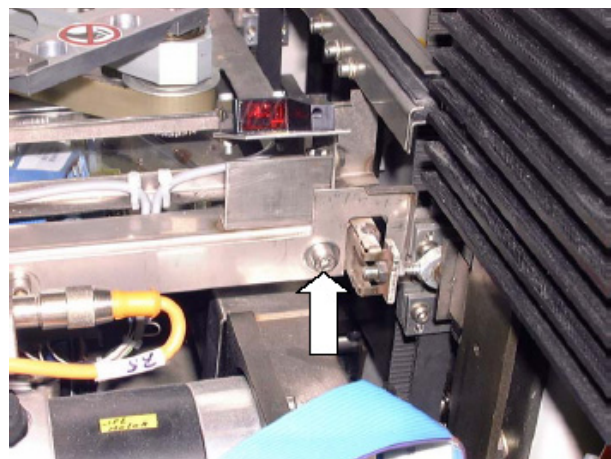
Required part(s)

1. Check

- Small misalignment can be adjusted by slightly loosen the three bolts of the small metal strip on front or rear-side wherewith the lift-plate is mounted between the vertical timing belts.
- When there is a large misalignment it is caused by the shifting over the vertical timing belts over their pulleys.

2. Correction

- According to the description on ?, but now just adjust the timing belt pulley in one corner.



H6-00017.fm

H6.13.5 Shifted in X or Y direction

Estimated time to complete [min.]:

Required special tools.

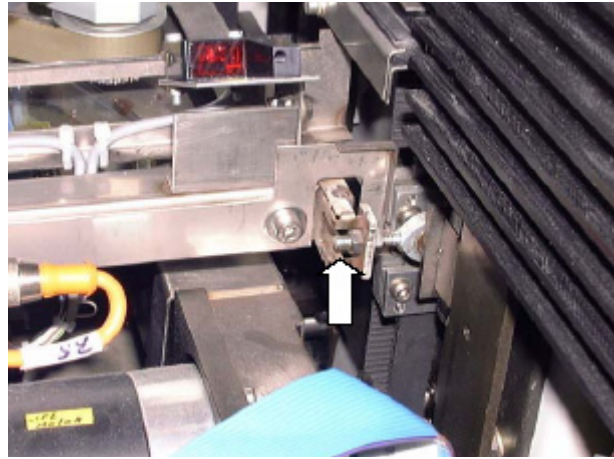
Required part(s)

1. Check

- Check position in comparison with a slot in storage area. If not in line, check for deformation of the small strips in front- or rear-side wherewith the lift plate is mounted between the vertical timing belts.

2. Correction

- There is a very small adjustment possible, but be very careful. With this adjustment the liftable is not in the middle between the vertical lift belts.
- Small adjustment can be done by changing the length of the ball-joint screw.



H6.13.6 Rotated around the z-axis

In this case the small metal strips must be deformed. It is better to replace the complete lift assembly.

H6.13.7 Final check

The lift assembly should be horizontal again and the counter-weights must be on equal heights.

1. Check

- This can be checked by using the two suspension beams 4022 532 0549.0.
- Measure the distance from topside of the beam to the topside of the guiding rail.
- Compare this value on the four corners of the lift plate assy.
- Adjust EPD puller in stock area, see [H6.3 EPD B01 puller in stock area, adjustment](#)
- Measure and adjust EPD puller tip in stock area and the zero coarse puller, see [H6.4 EPD B02, puller safe / puller zero coarse adjustment](#)
- Calibrate the tray trolley, see [H6.20 Tray trolley, calibrating](#)
- Install jumper X44 to overwrite calibration data.

H6-00017.fm

H6.14 Puller arm tip, height adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

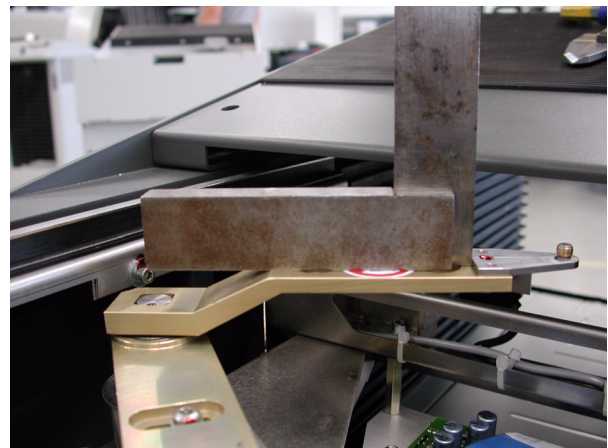
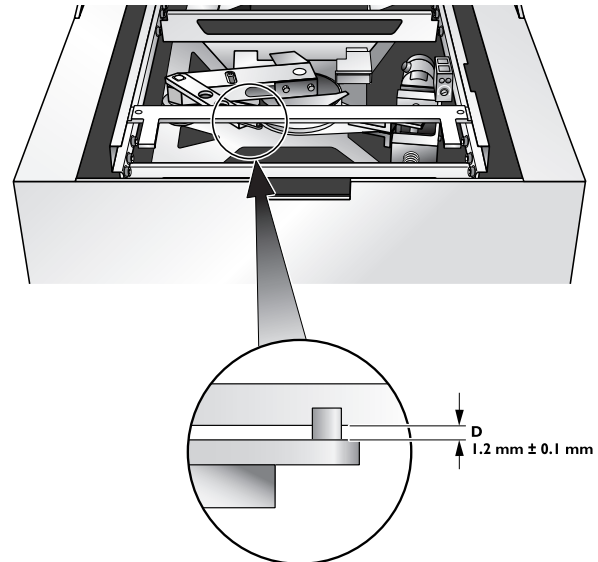
1. Prerequisites

- Install the carrier detection adjusting tool between the guides.
(Remove the two screws of the tool).

Note: Make sure to install the carrier detection adjusting tool upside down.

2. Adjustment

- Check with a square hook if the puller arm is not bent.
- Replace the puller arm if it is bent.
- Measure the z-distance 'D' ($1.2 \text{ mm} \pm 0.1 \text{ mm}$) at several positions with feeler gauges.
- Correct the height by loosening the adjustment screw of the puller arm (2 in 36).
- Move the puller arm up or down until the distance 'D' is $1.2 \text{ mm} \pm 0.1 \text{ mm}$.



H6-00005.fm

H6.15 Lift stops in tray trolley, adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

Four position checks should be made as follows (Figure 26):

Lift-up mechanical stop

1. Move the lift manually to its uppermost position. ($Z = 0$ of the guide rail equal to the bottom side of the frame).
2. Measure the distance ' D_1 ' ($D_1 = 2.5 + 1 \text{ mm}$).
3. If the distance is smaller, check the distance of the counter-weight with respect to the end stop bolt.

Lift-down mechanical stop

1. Move the lift to slot 47.
2. Measure the distance ' D_2 ' ($D_2 = 2.5 + 1 \text{ mm}$).
3. Adjust the distance by moving the counter-weight with respect to the belt.

EPD lift-up

1. Move the lift manually to its uppermost position. ($Z = 0$ of the guide rail equal to the bottom side of the frame).
2. Check that the EPD has activated.
3. Move the sensor 2 mm down and make sure that the sensor remains active.

Zero fine lift

1. Move the lift manually to its uppermost position. ($Z = 0$ of the guide rail equal to the bottom side of the frame).
2. Shift the controller outside.
3. Remove the cover plate.
4. Connect the encoder tester to the lift motor encoder.
5. Check that the zero fine signal is present only once during the EPD lift-up signal. The zero fine signal must also be shifted a quarter rotation of the lift motor with respect to the EPD lift-up signal.

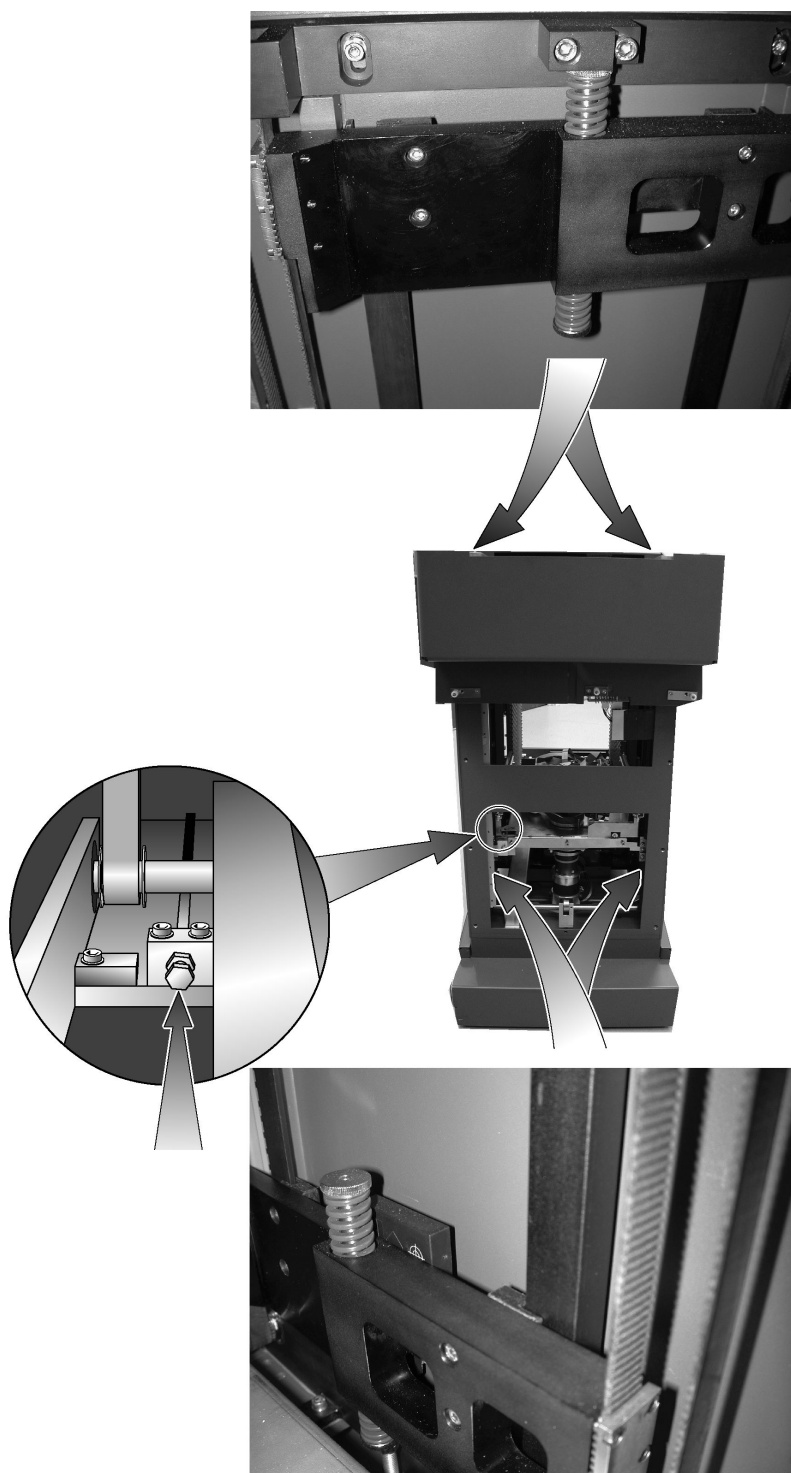


Figure 26 Lift adjustment

H6-00009.fm

H6.16 Lift Lock spring, adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1. Move the carrier to the pick position.
2. Measure the distance at 'D' (Figure 27) (to lock the carrier in the pick position the lock spring must be adjusted to 149.4 ± 0.2 mm from the inner side of the frame with respect to the centre of the lock spring).

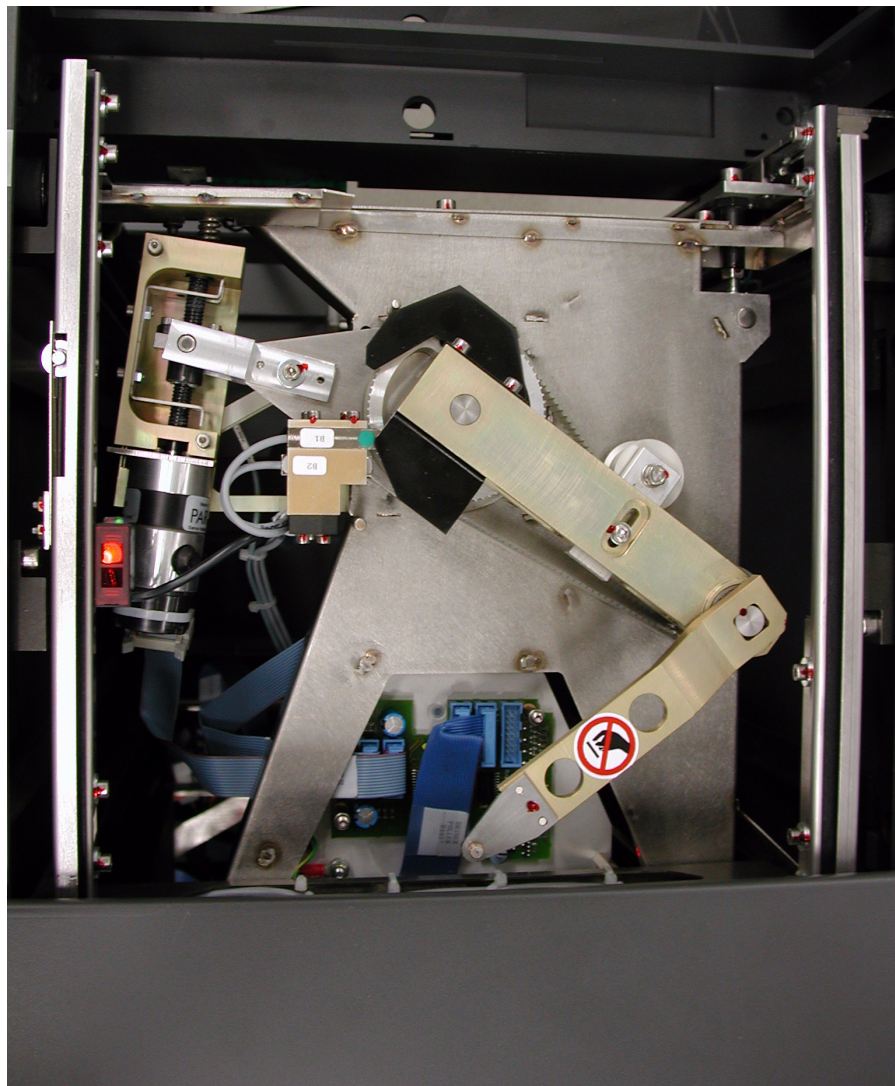


Figure 27 Lock spring adjustment

H6-00010.fm

H6.17 Vertical lift belt, adjustment

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1. Prerequisites

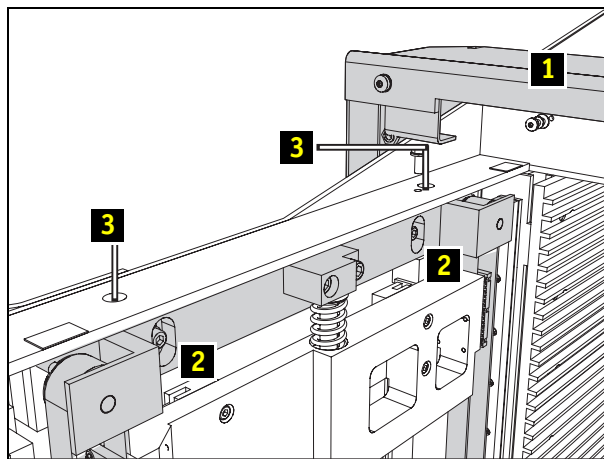
- Remove cover on top of tray trolley (1).

2. Adjust the vertical lift belt tension

- Release both bolts (2).
- Adjust the belt tension by turning the Allen bolts (3).
- Check belt tension, see [H7.2 Belts in tray trolley, checking](#)
- Repeat this procedure at the other side.

3. Finalize

- Tighten both bolts (2).
- Mount cover (1).



H6-00012.fm

H6.18 Drive belt of tray trolley lift, adjustment

Estimated time to complete [min.]:

Required special tools.

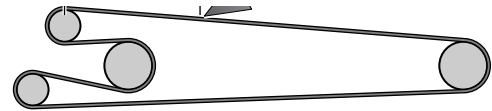
Required part(s)

1. Prerequisites

- Remove the drive belt cover.

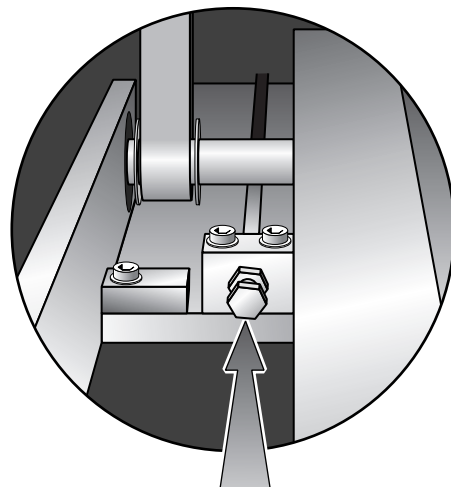
2. Adjusting the drive belt

- Check tension of the drive belt, see [H7.2 Belts in tray trolley, checking](#)
- The drive belt can be adjusted by the screws.



3. Finalize

- Place the drive belt cover back.
- When fastening the cover, take care not to touch the axes.



H6.19 Puller motor timing belt, adjustment

Estimated time to complete [min.]:

Required special tools.

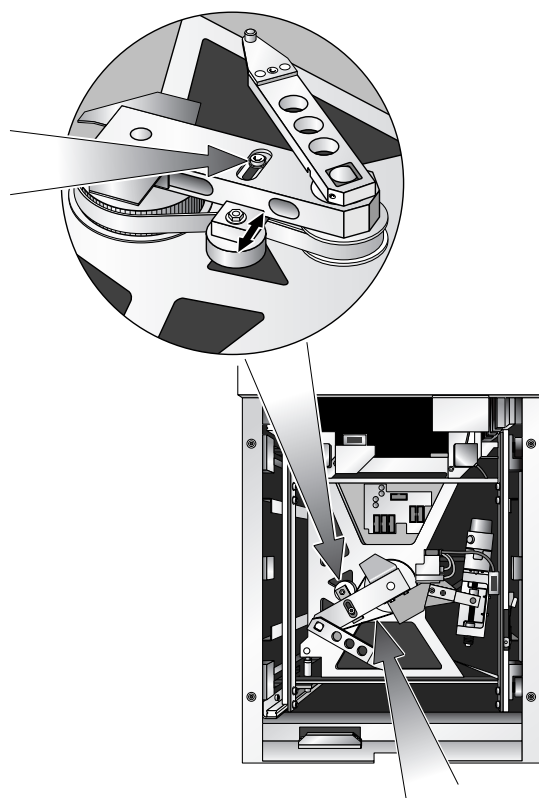
Required part(s) Belt tension indicator

1. Prerequisites

•

2. Adjusting the puller motor timing belt

- Check tension of the puller motor timing belt, see [H7.2.Belts in tray trolley, checking](#)
- Loosen adjustment screw of spring tensioner, apply hand pressure to the tensioner and tighten adjustment screw and check tension again.



H6-00014.fm

H6.20 Tray trolley, calibrating

Estimated time to complete [min.]:

Required special tools.

Required part(s)

All manual servo actions must be performed with doors closed and emergency switches pressed.



ESD SENSITIVE ELECTRONICS

Electro Static Discharge may cause damage to electronics.

Work in an ESD safe environment or use ESD preventive measures.

1. Prerequisites

- Performed all the necessary adjustments first.
- The tray trolley must be connected to the system via an extension cable [H6.2 Tray trolley, connecting with extension cable](#)).
- Power up the machine, the calibration program runs via the process controller.

2. Start-up TIP tools

- Log on to system as an Administrator (see ?)
- Wait until the status window of the process controller is disappeared (This means the aPC is booted)

Note: If it takes longer than 5 minutes for the aPC Status window to disappear it is possible that the aPC booted before the boot procedure of the aSC was finished. In that case one could also continue to the next step.

- Double-click the icon "VNC APC" on the desktop to start the Vnc program
- Wait until the desktop of the aPC becomes visible.

Note: If the program could not connect to the aPC it will give a warning. This means the aPC is probably not booted yet, wait a few seconds and try again.

- On the desktop of the aPC double-click the icon "Start aPC processes for TIP". This will start only those processes that must run for the use of the tiptools.
 - On the desktop of the aPC double-click the icon "TIP tools" to start the tiptools.
 - Enter: get programs.tip
 - Select: < option C > (see chapter 10.2.2)
 - At the question: "Do you want to test Nodes?" press "No "
- Following message appears on screen: "An AQ Tray Trolley with 47 carriers is detected. Type any key to continue."

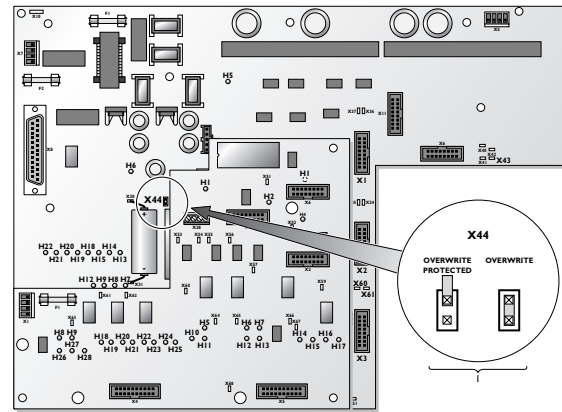
Note: Make sure to press the "Enter" key only once. Otherwise you are one step ahead. This can lead to a wrong calibration.

- Follow the sequence given in following procedure.

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3. Clear the calibration values in tray trolley

- Get access to the tray trolley controller, see [H8.1 Tray trolley controller, replacement](#)
- Install jumper X44 to overwrite calibration data. Servo power must be on.
- Select N (new controller).
- Select A (purge flash prom).
- Select C (reset all parameters in flash prom). Default values loaded from software.
- Select 0 (exit).

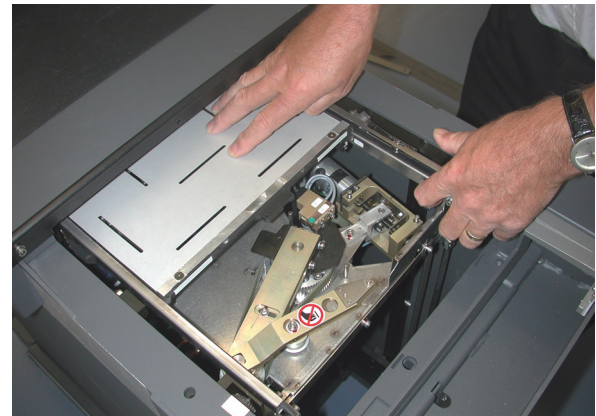


4. Lift calibration

- Select C (calibration).
- Select A (calibrate lift offset).
- Press any key to start initialising.
Message: *'Trolley initialises'*
- Press any key to switch off amplifiers.
Message: *'Amplifiers switched off'*

5. Zero position of tray trolley lift calibration

- Push the emergency stop to release the servo power.
- Message: *'Move lift manual to zero position and press enter key when finished'*
- Place the calibration tray in the first slot.
- Use the aluminium calibration tray to match the lift height to the store height of the calibration tray.
- Check that the aluminium calibration tray moves smoothly from the store into the lift and vice versa.



Note: No bumps are allowed!

- Press any key.
- When finished move the tray back in the stock area and move the puller arm back to the safe position.
- New zero offset written into RAM.

6. Calibrating the pick position

Message: 'Move lift manually to pick position'.
'Press any key when finished'.

- Adjust Z-calibration tool to 3 ± 0.05 mm.
- Place Z-calibration tool and secure it with the two screws (1).

Note: Check if the extension tables are not clamped between tool and trolley frame.

- Manually load calibration tray in pick area.

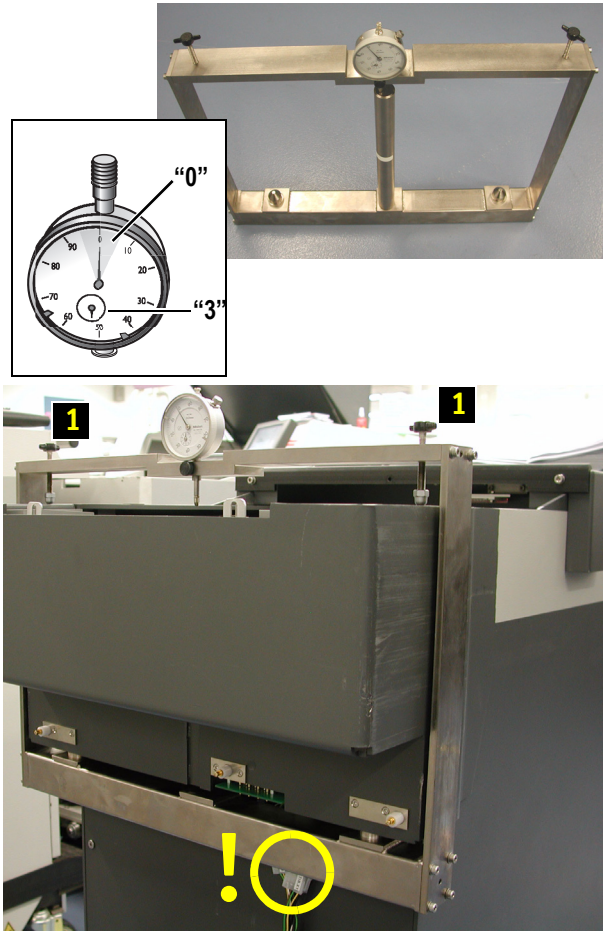
Note: Do not bend the puller arm!

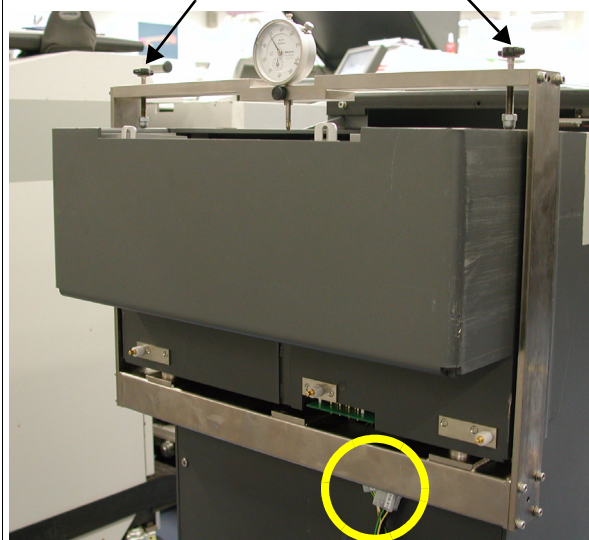
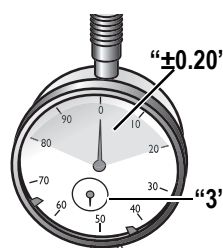
- Raise the lift manually and make sure that the gauge tip touches the calibration tray just behind the aluminium strip.
- Keep the lift in the position where the gauge reads 3 ± 0.2 mm, and press any key.

Message: 'New pick position written into RAM.'

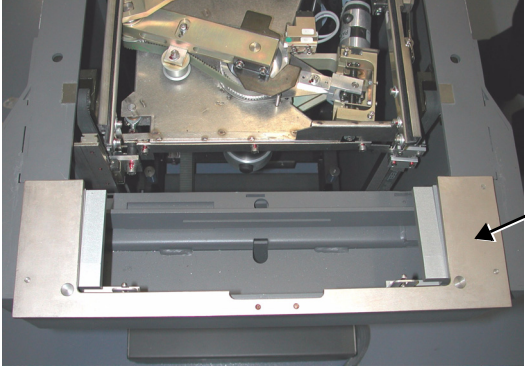
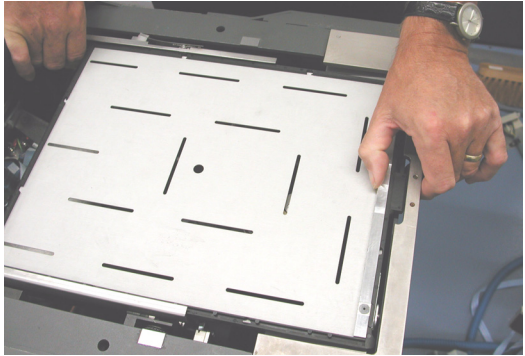
- Select W (write to flash prom)
- Write down the values for:
 - * 'lift offset'
 - * 'pick position'...
- Switch on servo power, by pulling the emergency key
- Select R (Read pos. flash prom)
- Verify these values with the noted values.
- Remove tray manually.
- Place tray back in store and move puller arm to a safe position.
- Remove the Z-calibration tool.

Note: Do not bend the puller arm.

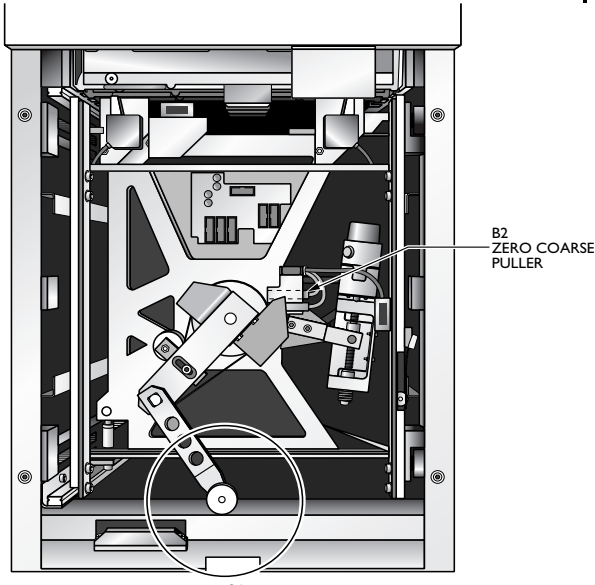
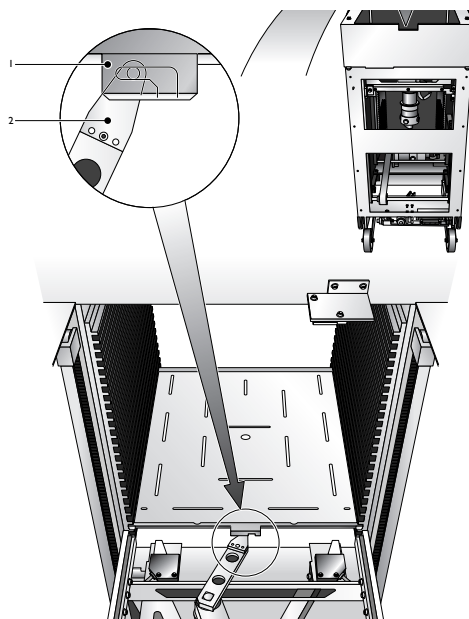


PC ACTION	MANUAL ACTION	ACTION VISUALISED	
Pick position			
Message: Move lift manually to pick position. Press any key when finished.	Place Z-calibration tool and lock it with the two screws (see arrows in the picture). Note: Check if the extension tables are not clamped between tool and trolley frame.		
	Manually load calibration tray in work area Trolley. Do not bend the puller arm!		
	Raise the lift manually and make sure that the gauge tip touches the calibration tray just behind the aluminium strip. Keep the lift in the position where the gauge reads 3 ± 0.2 mm, and press any key. 		
Message: New pick position written into RAM.			
Select W (write to flash prom)	Note down all values (lift offset and pick position).	Lift offset1097 Real lift position-517 Pitch position575 Hook position0 Eject position150 Pick position-517 Lever zero position0	Note: The values shown here are just an indication.
Switch on servo power.	Pull the emergency key!		
Select R (Read pos. flash prom)	Verify these values with the noted values. Remove tray manually. Place tray back in store and move puller arm to a safe position. Remove the Z-calibration tool. Do not bend the puller arm!		

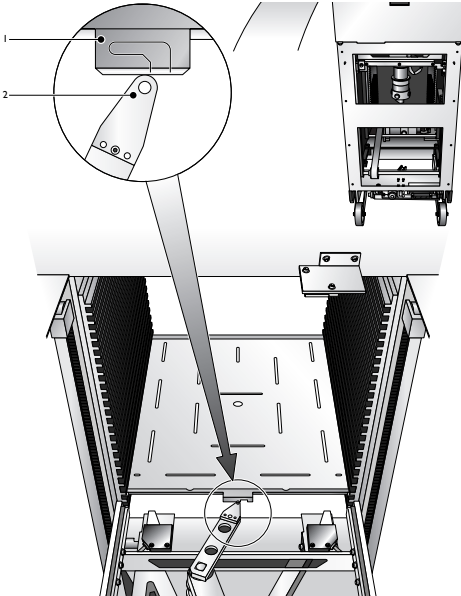
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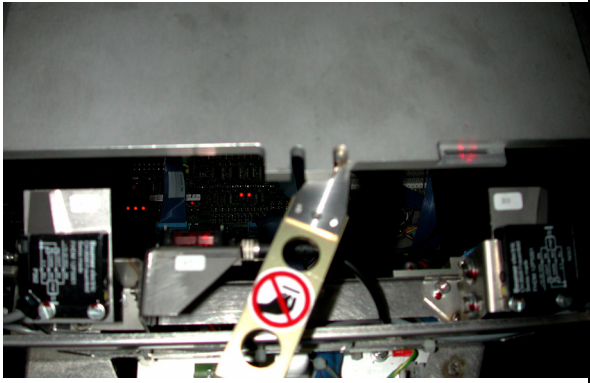
PC ACTION	MANUAL ACTION	ACTION VISUALISED
Puller		
Select S (select servo).		0, 1, 2 make your choice.
Select 1 (puller).		
Select A (calibrate puller offset).		
	Check the following: - Is the door closed? - Are the trays in position (laser sensors not activated)? - Is the servo power on?	
Message: Press any key to start initialising.	Trolley initialises.	
Message: Press any key to switch off the amplifiers.	Amplifiers switched off.	
	Push the emergency stop to release the servo power.	
Message: Move puller manual to pick position. Press any key when finished.		
	Place the Y-calibration tool (1)	
	Move and hold the puller manually to the pick position. To do so, load the calibration tray in the work area. Move and hold the calibration tray as far as possible to the pick position. Push the tray fully in against the tool. Do not lower the lift as this could damage the puller. The tool is positioned with dowel pins.	
Message: Press Enter to write new pick position to RAM		
Message: New pick position written into RAM		

H6-00015.fm

PC ACTION	MANUAL ACTION	ACTION VISUALISED
	Return the calibration tray into the store manually and remove the Y-calibration tool.	
<p>Message: Manually move puller to the lift position.</p>	<p>Install 26 mm adjustment ring</p> <p>Move and hold the puller manually to the lift position with the lift at tray position 14.</p> <p>The snap-in motor is in the lock position after previous calibration (if not touched, it is OK).</p> <p>Do not bend the puller arm! Press any key.</p>	
<p>Message: Press Enter to write new lift position to RAM.</p>		
<p>Message: New pick position written into RAM.</p>		
	Remove 26mm ring and move puller to a safe position.	
	Install a calibration tray in position 23.	
<p>Message: Move puller manual to hook position. Press any key when finished.</p>		
	<p>Move puller to the hook position and hold the puller manually.</p> <p>Do NOT change or rotate motor position snap-in! Press any key.</p>	

H6-00015.fm

PC ACTION	MANUAL ACTION	ACTION VISUALISED
Message: New hook position written into RAM.		
Message: New park position written into RAM.		
Message: Move puller manual to eject position. Press any key when finished.	<p>Move the puller manually to eject position. Move calibration tray to the eject position. Push the puller arm tip (not the puller catch pin!) against the calibration tray [at position 23] (snap-in lock position). Press any key.</p> <p>NOTE: When the tray is ejected, it is pushed out with the puller arm tip and not with the puller catch pin.</p>	
	<p>Note all values. Press Enter to write new eject position to RAM.</p>	<p>Puller offset0 Real pull position14692 Lift position990 Pitch position10606 Hook position14006 Eject position14692 Pick position-5658</p> <p>Note: The values shown here are just an indication.</p>
Message: New eject position written into RAM.		
	Return puller arm to safe position.	
Select W (write to flash prom)		
	Reset the servo power, pull emergency key.	
Select R (Read positions from flash prom)	Verify these values with previous noted values.	

PC ACTION	MANUAL ACTION	ACTION VISUALISED
Snap-in		
Select S (servo)		
Select 2 (Snap-in)		
Select A (Calibrate snap-in positions)		
	Check the following: - Is the door closed? - Are the trays in position? - Is the servo power on? - Is the puller arm safe?	
Message: Press any key to start initializing.		Trolley Initialises
Message: Press any key to switch off amplifiers.		Amplifier switches off.
	Press emergency key	
	Install the calibration tray in position 23.	
Message: Move the snap-in to the free position. Press key when finished.	Turn the snap-in until the snap-in pin falls into the free position (the narrow right slot) see picture. Press any key.	

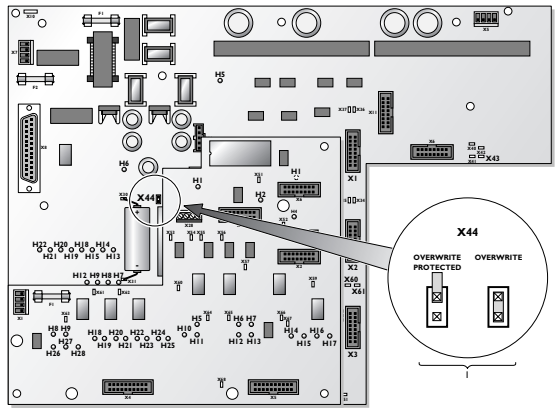
PC ACTION	MANUAL ACTION	ACTION VISUALISED
Press Enter to write new free position to RAM.		
Message: New Free position written into RAM.		
	Move puller to save position.	
Select W (write to flash prom)	Note all values.	Snap offset0 Real snap-in position14692 Free position9237 Lock position10606 Note: The values shown here are just an indication.
	Pull emergency key.	
Select R (Read positions from flash prom)	Verify these values with previous noted values.	
Select 0 (exit)		
	Wear an ESD bracelet! Place jumper in write-protected position. Place back controller and fasten screws. Close door.	
	Remove the calibration tray.	
Perform an endurance test (10 minutes): - Select E - Select P - Select H: tray position 5 - Enter - Select I: tray position 36 - Enter - Place trays in position 5 and 36. - Select A (start endurance) - Run endurance test for the required period - Press control C to stop endurance.		

Figure 28 Tray trolley calibration

H6.20.1 Log off procedure

To log off, use the following procedure:

1. At prompt >>> type: exit or close window with mouse pad (x)
2. After using the tiptools double-click the icon "Kill APC Processes" to stop all running APC processes.
3. Close "VNC aPC"

4. Shutdown NT on aPC and aSC by double-click on the power-down icon. This icon is located on the aSC.

REMARK: Remark: This is the most save method for shutting down the aPC an aSC. Do not use shutdown in windows you will shutdown only aPC or aSC depending which desktop current is.

5. Restore the automatic log on procedure (see 10.2.1.3)

H6.20.2 Read flash prom calibration values

The calibration values of the tray trolley can be saved on disc (aPC) and later-on be saved via FTP on floppy for a print usage.

Start-up TIP tools:

1. Log on as Administrator (see chapter 10.2.1)
2. Wait until the aPC Status window is disappeared (This means the aPC is booted)
If it takes longer than 5 minutes for the aPC Status window to disappear it is possible that the aPC booted before the boot procedure of the aSC was finished.
In that case one could also continue to the next step.
3. Double-click the icon "VNC APC" on the desktop to start the Vnc program
4. Wait until the desktop of the aPC becomes visible.



NOTE: If the program could not connect to the aPC it will give a warning. This means the aPC is probably not booted yet, wait a few seconds and try again.

5. On the desktop of the aPC double-click the icon "Start aPC processes for TIP".
This will start only those processes that must run for the use of the tiptools.
6. On the desktop of the aPC double-click the icon "TIP tools" to start the tiptools.
7. Enter: `get programs.tip`
8. Select: < option A - E > (see chapter 10.2.2)
9. At the question: "Do you want to test Nodes?" press "No"
10. enter: `get fctflash.tip`
11. Give section nr: enter the required section number
12. enter: `save_flash`

The file is saved in `c:\user\apc\work\FCTflash.txt`

To read the file, browse with explorer and double-click on *FCTflash.txt*

For the log off procedure, please see section [H6.20.1](#).

CHAPTER H7 Maintenance instructions



NOTE: Only a regional service engineer is allowed to remove a sealed bolt. After replacing the bolt, it needs to be sealed again. Therefore Loctite 7400 coating is required. In general, when a sealed bolt has been replaced it needs re-adjustment.

H7.1 Required Equipment

- Standard tool set;
- Vacuum cleaner;
- Fibre free tissue;
- Isopropanol (99.7% pure, de-naturalized by 5% methanol);
- Lithium based grease;
- De-greasing/Cleaning spray;
- Multimeter;
- Grease gun;
- Belt tension indicator (30Hz - 500Hz);
- Lens tissues.



NOTE: When the system is switched off by means of the main switch, this main switch must always be locked by a padlock!



WARNING: The tray trolley contains two laser sensors. These laser sensors are class II lasers and can cause serious injuries. Therefore, don't look into the laser beams.

WARNING: Before starting maintenance work, operate correct system shut-down procedures and switch off the factory power at the main power switch.

WARNING: Isopropanol is poisonous and highly flammable. Observe the manufacturer's safety precautions when using isopropanol.

CAUTION: Never use compressed air to clean. Waste can be blown into fine mechanical parts causing damage or malfunctioning.

CAUTION: To avoid component damage by ESD, connect body mass to an ESD point before starting maintenance on the system.

H7.1.1 Required Maintenance Tray trolley

ITEM	ACTION	LOADING	REMOVAL	6-MONTHLY
Tray trolley:	8A.7.5			
Calibration markers		Check		
LED captions		Clean		Check
Snap-in spindle				Lubricate
Safety switch		Check		
Door contact		Check		
Cooling fan		Check	Clean	
Micro switches		Check		
Connector		Check		
Connector linkage		Check		Lubricate
Roller bearings		Check		Lubricate
Proximity shock absorber		Check		Lubricate
Controller status LEDs		Clean		Check
Puller motor belt				Check
Lift motor belt				Check
Lift motor brake				Check
Lift conveyor belts				Check

Figure 29 Maintenance periods



NOTE: When lubricating or cleaning with isopropanol, make sure to wear gloves to avoid skin contact.

- Clean trolley interface surface with a vacuum cleaner and fibre free tissue moistened with Isopropanol.
- Circuit breaker
 - Open circuit breaker F1 and connect a voltmeter between pins 1 and 2 of connector X2, voltmeter should read 0V;
 - Close circuit breaker F1, voltmeter should read battery voltage (12V fully charged).
- Calibration markers
 - Clean the markers using fibre free tissue moistened with Isopropanol.
- LED captions
 - Clean the captions using fibre free tissue moistened with Isopropanol;
 - Check the captions for signs of damage and replace where the identification is illegible.

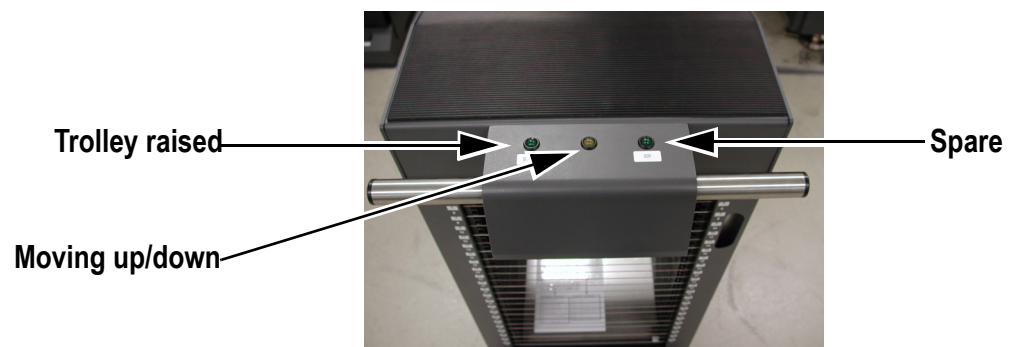


Figure 30 Hoist status LEDs

H7-00001.fm

- Snap-in spindle
 - Clean the snap-in spindle using de-greasing spray and fibre free tissue;
 - Lubricate the spindle lightly with NSK grease no. 2.
- Door contact
 - Check door contact operation by connecting a multi meter to contacts 67 and 68 of hoist terminal block X101;
 - Close contact, multi meter must show a closed circuit;
 - Repeat procedure for contacts 5 and 2 at hoist I/O connection X2.
- Cooling fan
 - Clean cooling fan blades using fibre free tissue and Isopropanol;
 - Check cooling fan operates when trolley is connected to the placement system.
- Connector 'Pogo Pin'
 - Check connector contacts for signs of damage;
 - Ensure movement of swivel arm is smooth and brings the connector into a lateral position when fully extended.
- Connector linkage
 - Clean connector linkage, slide and bearing using de-greasing spray and fibre free tissue;
 - Lubricate linkage slide and bearing lightly with grease.
- Roller bearing
 - Clean roller bearing using de-greasing spray and fibre free tissue;
 - Lubricate tie bar bearings lightly with grease.
- Controller status LEDs
 - Clean the controller status LEDs using fibre free tissue and Isopropanol;
 - Check the LEDs illuminate (Figure 31).

LED	ON	OFF
Yellow	Controller error	Normal operation
Green	Normal state	Endurance state

Figure 31 Controller - status LEDs

- Lift motor brake
 - Operate the lift and ensure that the motor brake operates when the motor stops (a faulty motor brake will allow easy hand movement of the drive);
 - Replace complete lift motor if brake is faulty.

H7.2 Belts in tray trolley, checking

Estimated time to complete [min.]:

Required special tools.

Required part(s) Belt tension indicator

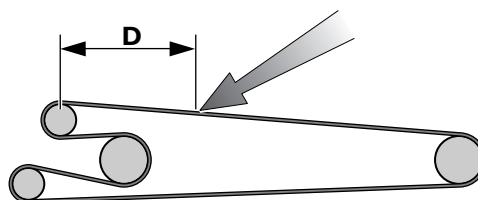
Using a, check each belt for tension (Figure 32).

BELT	FREQUENCY	D
Vertical lift belt	78Hz - 82Hz	30 cm
Lift motor timing belt	58Hz - 62 Hz	36 cm
Puller motor timing belt	300 ± 40 Hz	-
Hoist motor timing belt	100 ± 10 Hz	-

Figure 32 Belt tensions

1. Drive belt of tray trolley lift

- Check that the tension of the drive belt is **58 ± 4 Hz** at **D=36 cm**;
- Adjust if necessary, see [H6.18 Drive belt of tray trolley lift, adjustment](#)
- Replace belt when worn or if no further adjustment is possible, see [H8.5 Drive belt of tray trolley lift, replacement](#)



2. Vertical lift belts

- Check that the tension of the vertical lift belts is **78 ± 4 Hz** at 30 cm;
- Adjust if necessary, see [H6.17 Vertical lift belt, adjustment](#)
- Replace belt when worn or if no further adjustment is possible, see [H8.7 Vertical timing belt in tray trolley, replacement](#)

3. Puller motor belt

- Check that the tension of the puller motor belt is **300 ± 40 Hz**;
- Adjust if necessary, see [H6.19 Puller motor timing belt, adjustment](#)
- Replace belt when worn or if no further adjustment is possible, see [H8.6 Puller drive belt, replacement](#)

H7.3 Tray trolley sensors, cleaning

Estimated time to complete [min.]:

Required special tools.

Required part(s)

1.

H7-00003.fm

H7.4 Safety contacts in tray trolley, cleaning

Estimated time to complete [min.]:
Required special tools.
Required part(s)

1.

H7-00004.fm

CHAPTER H8 Installation and replacement instructions

H8.1 Tray trolley, replacement instructions



NOTE: Only a regional service engineer is allowed to remove a sealed bolt. After replacing the bolt, it needs to be sealed again. Therefore Loctite 7400 coating is required. In general, when a sealed bolt has been replaced it needs re-adjustment.

When the system machine is switched off by means of the main switch, this main switch must always be locked by a padlock!

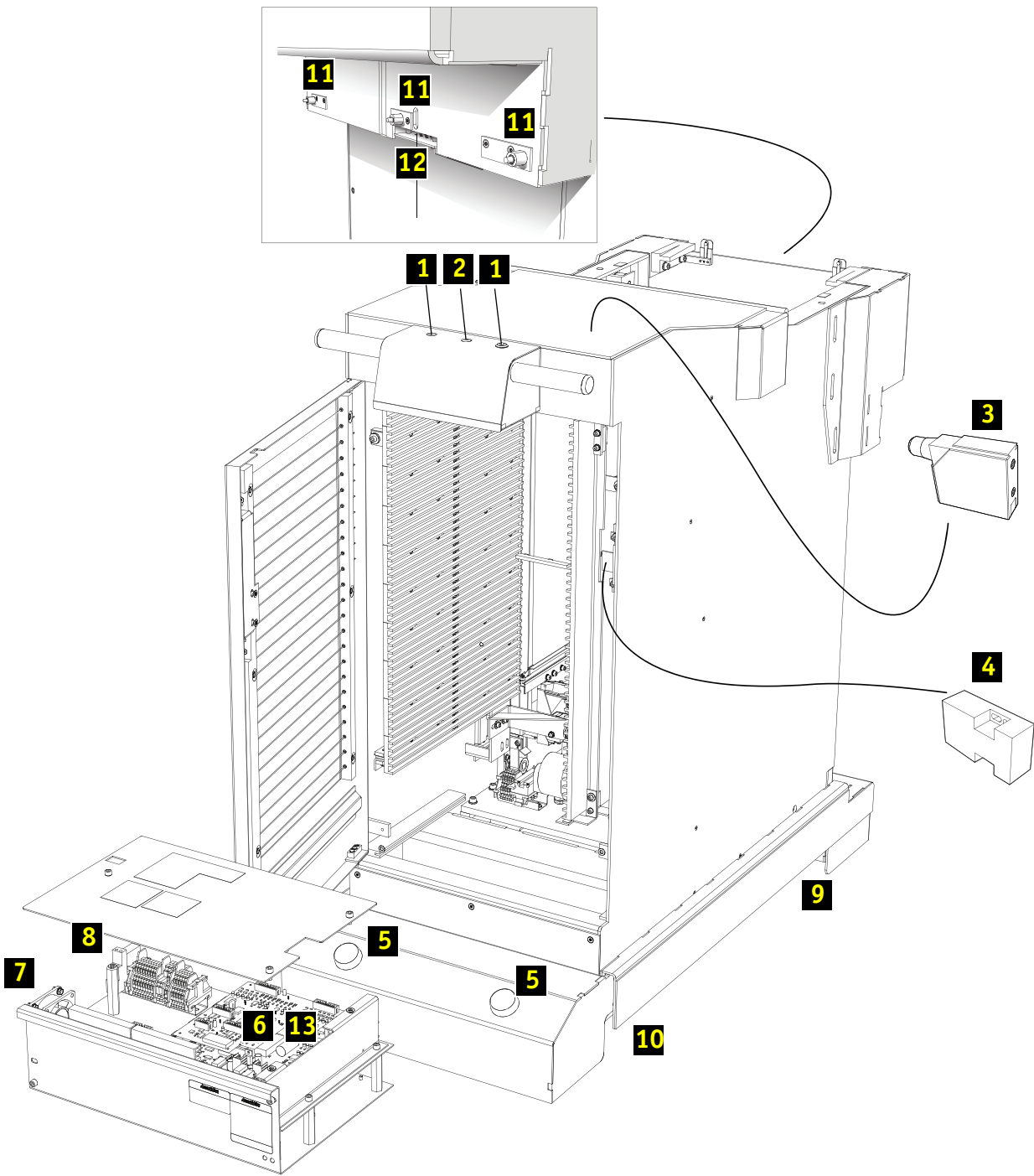
Before removing system components, operate correct shut-down procedures and switch off the factory power supply at the main switch.

To avoid component damage by ESD, connect body mass to an ESD point before starting maintenance on the trolley or the system.

H8-00001.fm

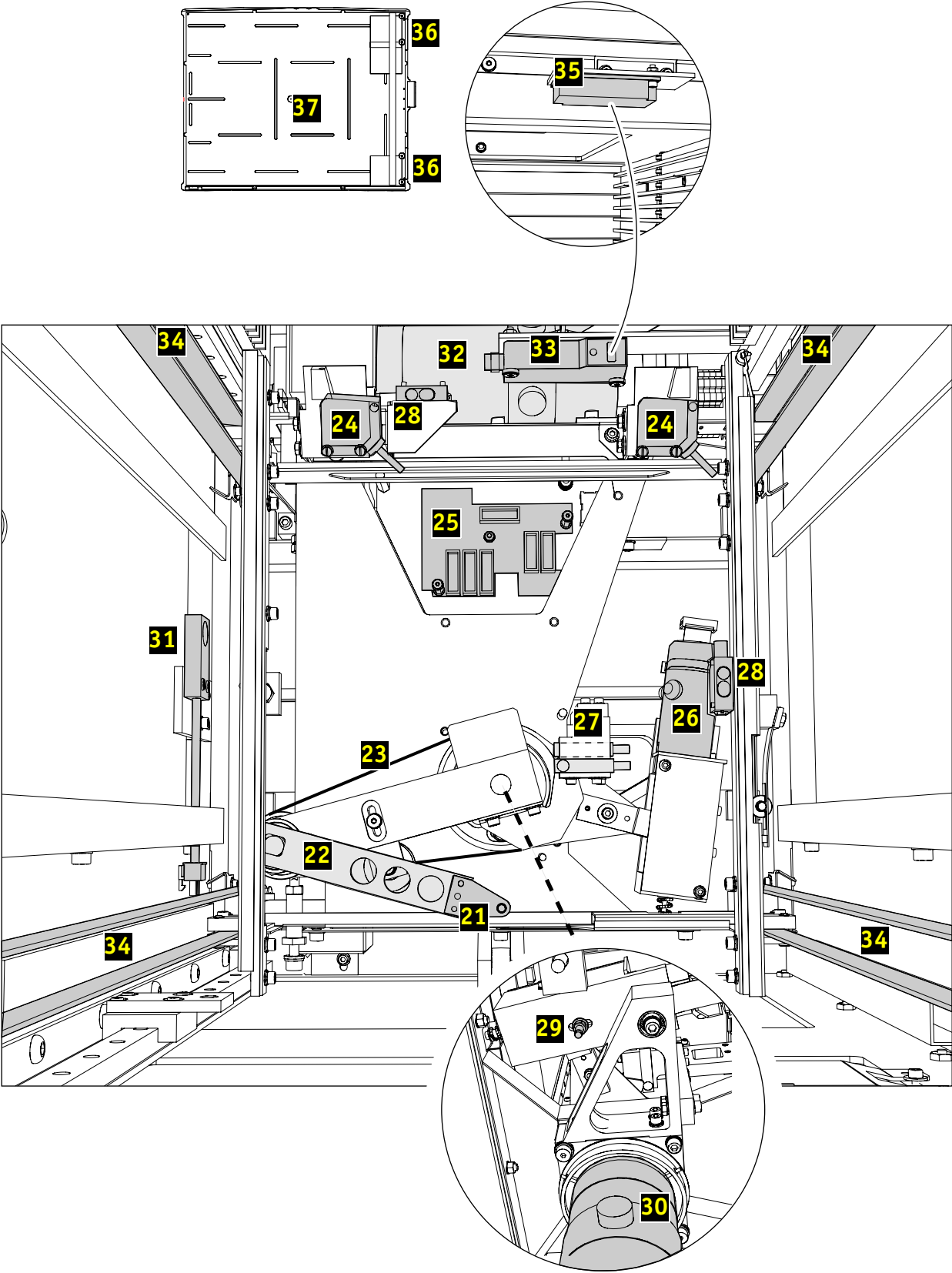
H8.0.1 Tray trolley, spares

Current spare parts list, see http://espares.assembleon.com							
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction
0	-	9498-396-01282	Tray trolley	1	-	-	PA 2681/00
		9498-397-01282	Tray trolley rep.	1	-	-	
1	-	5322-130-10688	Mult.led 24V green	2	-	-	
2	-	9498-396-01392	LED 2.5 V	1	-	-	
3	-	5322-132-00102	Laser sensor	1	Y	-	
4	-	9498-396-00103	Safety Contact AZ 16 ZV	1	-	-	
5	-	9498-396-00166	Foot switch	2	Y	-	
6	-	5322-216-04248	Tray controller	1	Y	1	
	-	9965-000-15027	Tray controller rep	1	-	RO	
7	-	5322-361-10926	Fan	1	-	-	24V dc
8	-	5322-280-10314	Relay 24V DC	1	Y	-	
9	-	9498 396 00162	Fixed wheel	2	-	-	
10	-	9498 396 00161	Swivelling wheel	2	-	-	
11	-	9498 396 00125	Contact pen	3	Y	-	
12	-	9498 396 00167	Connector board	1	Y	-	-
13		9498 396 00492	Fuse slow F5x20 2 A	2	Y	-	



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Current spare parts list, see http://espares.assembleon.com								Remarks
Item No.	Part of Item No.	Ordering Code	Description	Qty/ Mod	Priority indicator	Repair options	Replacement Instruction	
21	-	5322 395 10296	Catch pin	1	-	-		
22	-	9498 396 00163	Crank puller	1	Y	-		
23	-	9498 396 00164	Timing belt, puller	1	Y			
24	-	5322 132 00077	Light sensor	2	Y	-		(B08, B09)
25	-	5322 214 91176	Driver board	1	Y	-		
26	-	5322 361 10923	Snap-in motor	1	Y	-		
27	-	5322 218 11513	EPD	2	Y	-		Stock area (B01, B02)
28	-	9498 396 01277	Light sensor	2	Y	-		(B03, B04)
29	-	5322 210 20337	EPD	1	Y	-		Snap in (B10)
30	-	9498 396 00461	Puller motor	1	Y	-		
31	-	5322 218 11744	EPD Trolley	1	Y	-		(B06)
32	-	5322 361 11047	Lift motor	1	Y	-		RS420j
33	-	5322 132 00074	Laser sensor	1	Y	-		(B05)
34	-	5322 358 10191	Timing belt	4	Y	-		Vertical lift
35	-	5322 380 10146	Reflector	1	Y	-		
36	-	4022 530 08901	Vision marker	-	-	-		
37	-	9498 396 00165	Calibration tray	1	-	-		



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H8.1 Tray trolley controller, replacement

Estimated time to complete [min.]: ?

Required special tools. -

Required part(s). **H8.0.1.Tray trolley, spares**

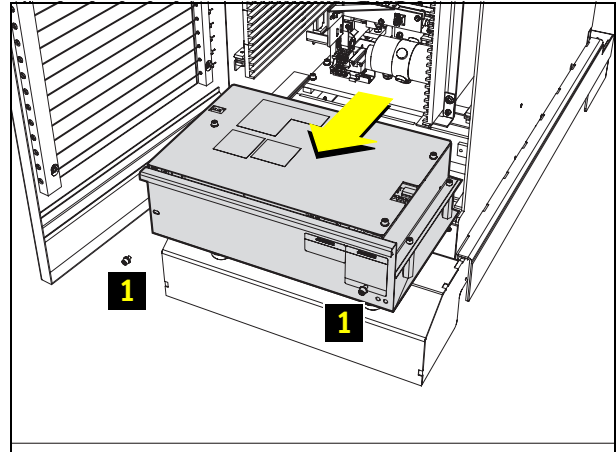
1. Prerequisites

- Open the tray trolley door.

2. Remove tray trolley controller cabinet

- Remove the two bolts (1) and slide the cabinet out.

Note: The sliding distance is restricted by the cable length.

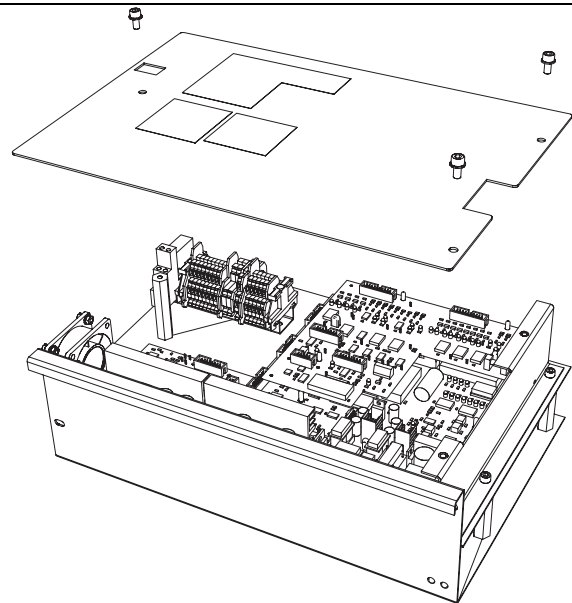


3. Removing

- Note jumper X44 setting, see **H5.3 Reference information**
- Identify and disconnect electrical connections;
- Remove the EPROM (unless damaged).

4. Assembly

- Remove new EPROM and replace it with the EPROM removed from the old board (unless damaged, in which case leave the new EPROM in place);
- Set Jumper X44 before installing the controller in the trolley.
- Board with new EPROM Software is now down loaded automatically.



5. Finalize

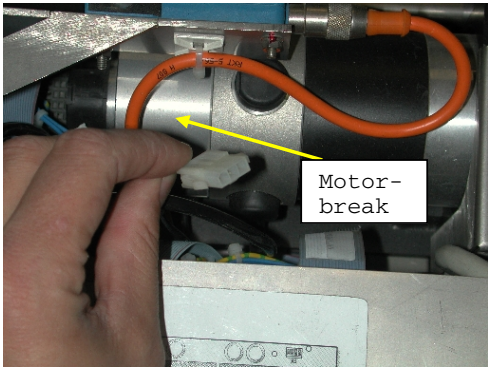
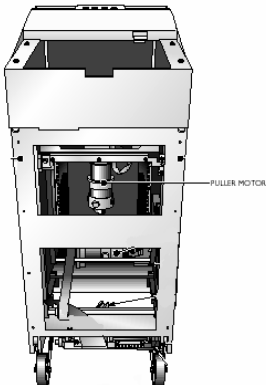
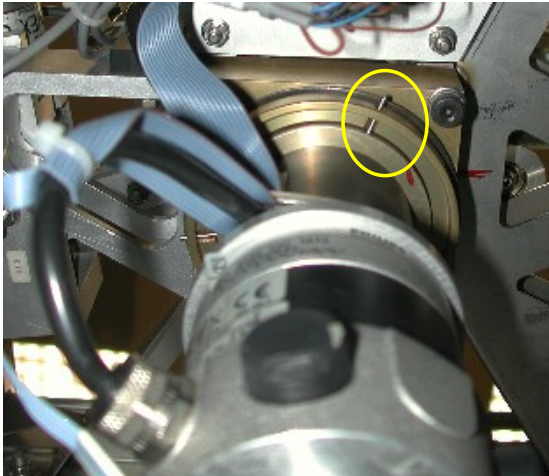
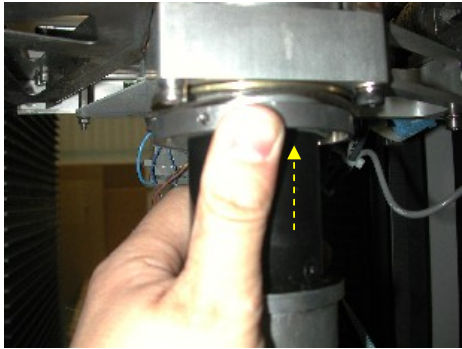
- Calibrate the trolley, see **H6.20 Tray trolley, calibrating**

H8-00002.fm

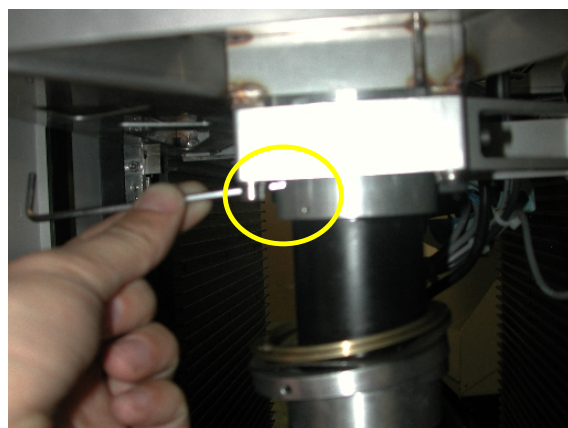
H8.2 Puller motor, replacement

Estimated time to complete [min.]: ?
Required special tools. -
Required part(s). **H8.0.1.Tray trolley, spares**

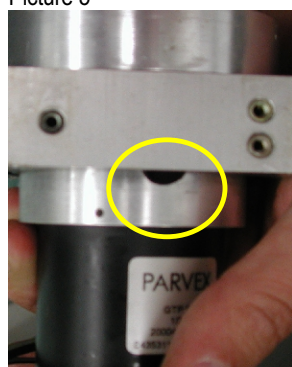
To remove the puller motor, the complete puller assembly must be removed. The lift unit must be calibrated afterwards.

 <p>Picture 1</p>	<p>Release the lift-brake and move the lift to the top position, Releasing the lift-brake can be done by applying 24 volts on the brake of the lift motor or doing this when the Trolley is connected to the machine.</p>
 <p>Picture 2</p>	<p>Remove the front cover of the Tray-trolley</p>
 <p>Picture 3</p>	<p>Remove the Pins (3x) from the puller motor. This is possible by pushing the ring against the spring action. (pins can be reused).</p>  <p>Picture 4</p>

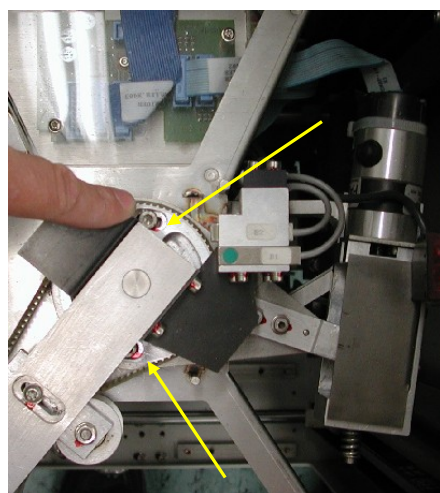
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Picture 5



Picture 6



Picture 7

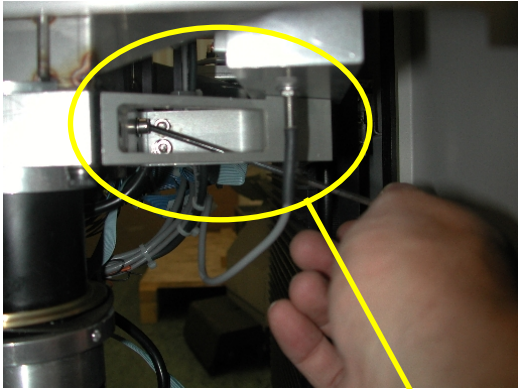

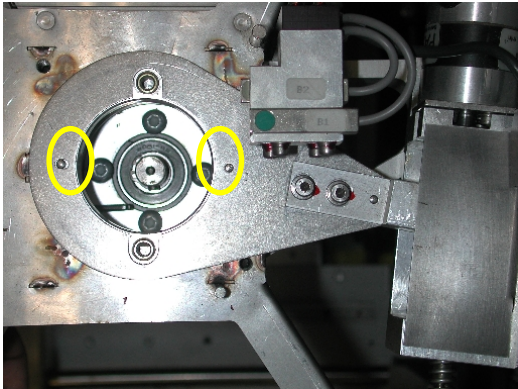
Picture 5:
Insert allenkey nr3 and release the coupling between motor and the topunit.

Picture 6:
Hole in which to insert the allenkey nr3

Release the allenscrews, make sure that the position of the puller is known before you release the screws.

The (Top)-puller unit can be removed now, (tooth-wheel with belt & puller-arms+ coupling)

TIP: make a digital picture before taking the top off, this to make sure that you don't put it back on 180 degr.

 <p>Picture 9</p>	<p>Remove the “snap-in motor” bracket from the puller motor unit (3 allenscrews)</p>
 <p>Picture 10</p>	<p>Remove puller-motor unit 4 allenscrews, (mind the cables with which the motor is connected).</p>
 <p>Picture 11</p>	<p>For remounting; work in opposite sequence, mind that the centre-pins fall in the hole. (in picture 11.)</p>

- Calibrate the trolley, see [H6.20 Tray trolley, calibrating](#)

H8-00014.fm

H8.3 Lift motor of tray trolley, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). **H8.0.1.Tray trolley, spares**

1 describes how to remove the lift motor from the Tray Trolley.

Action	Description	Figure
Remove the controller cabinet from the tray trolley. The controller cabinet is located at the front of the tray trolley.	Open the trolley door. Remove the two bolts at the front of the controller cabinet. Carefully move the controller cabinet out. Remove the two bolts on the right and the bolt on the left of the controller cabinet cover. Remove the cover of the controller cabinet. Now wear an ESD-bracelet. Disconnect all flat cables. Disconnect the motor cable (feedcon X5). Disconnect the bitbus cable (feedcon X8). Disconnect the power cable of the controller cabinet and the tray trolley.	see 3
Release the lift motor brake with an external power supply to the motor brake.	Disconnect the lift motor brake connector X1 and apply external power supply of 24 V between pin 1 (+ve) and pin 2 (-ve) on the motor side, to release the brake of the lift motor and re-connect X1 after adjustment (polarity sensitive).	see 3
Remove the cover plate at the back of the trolley.		
Carefully pull the lift up to its highest position.		
Place the suspension beams and brackets. Make sure that the brackets' screws are turned completely upwards (outwards) when placing them.	Refer to 4, positions A and B to see how the suspension beams and brackets must be placed.	see 4
Carefully lower the lift (manually) so that there is a slight tension on the suspension brackets.		
Now enable the lift motor brake again by disconnecting the 24V external power supply.	If slackness occurs, tighten the screw a little.	
Remove the cover over the lift motor belt.		
Both lift axes must remain in the same position in relation to each other. So it is important to prevent movement of the axes.	To prevent movement of the axes: Mark both the belt and the timing belt pulley of both axes (front and rear) with an indelible marker pen. To be able to do so, it might be necessary to clean the often greasy surfaces with tissue.	For marking the belt and timing belt pulley see 5

H8-00011.fm

Action	Description	Figure
Loosen the lock-nut of the belt tension adjuster (1 in 6).		see 6
Turn the belt tension adjuster clockwise (outwards, seen from the front side of the machine) until the belt tension block is completely slack.		see 6
Loosen the two lock bolts (2 in 6) from the lift motor belt tension block.		see 6
Disconnect the lift encoder cable.		
Disconnect the lift motor brake cable.		
Disconnect the lift motor power supply cable.		
If there is a tie wrap, remove it.		
Remove the 4 motor fastening bolts (1 in 7).	It is easiest to remove the lower three bolts first and then the upper one.	see 7
Remove the lift motor.		

Figure 1 Removing the lift motor

2 describes how to place a new lift motor on the tray trolley.

Action	Description	Figure
Place the lift motor according to 3 for cable positioning.		
Place the motor timing belt pulley through the belt.		
Fasten the motor bolts (1 in 7)	It is easiest to fasten the upper bolt first, then the three lower bolts. Make sure to fasten the bolts well.	see 7
Make sure that the marks on the lift timing belt pulley and belt match.		
Tighten the belt with the help of the belt tension adjuster.	The correct belt tension can be determined with the frequency meter. However, this is not done until the encoder offset has been checked and found to be OK.	see FIGURE 8A-45
Fasten the lock nut hand-tight.		see 6
Check the marks on the belts and the timing belt pulleys. Reposition the belt if necessary.		see 5
Take care to insert the encoder plug with the cam (1 in 8) facing the lift motor.		see 8
Connect the controller cabinet in the opposite way to removal. Make sure to wear an ESD-bracelet before starting work on the controller cabinet. See FIGURE 8A-85 for cable positions.		

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Action	Description	Figure
Before moving the controller cabinet back into the tray trolley, put the cover back on and fasten the screws hand-tight.		
Release the lift motor brake with an external power supply to the motor brake.	Disconnect the lift motor brake connector X1 and apply external power supply of 24 V between pin 1 (+ve) and pin 2 (-ve) on the motor side, to release the brake of the lift motor and re-connect X1 after adjustment (polarity sensitive).	see 3
Move the lift up and remove the suspension beams and brackets.		see 4
Adjust EPD lift up (see section H6.7 EPD B06 in tray trolley, adjustment).		

Figure 2 Placing a new lift motor

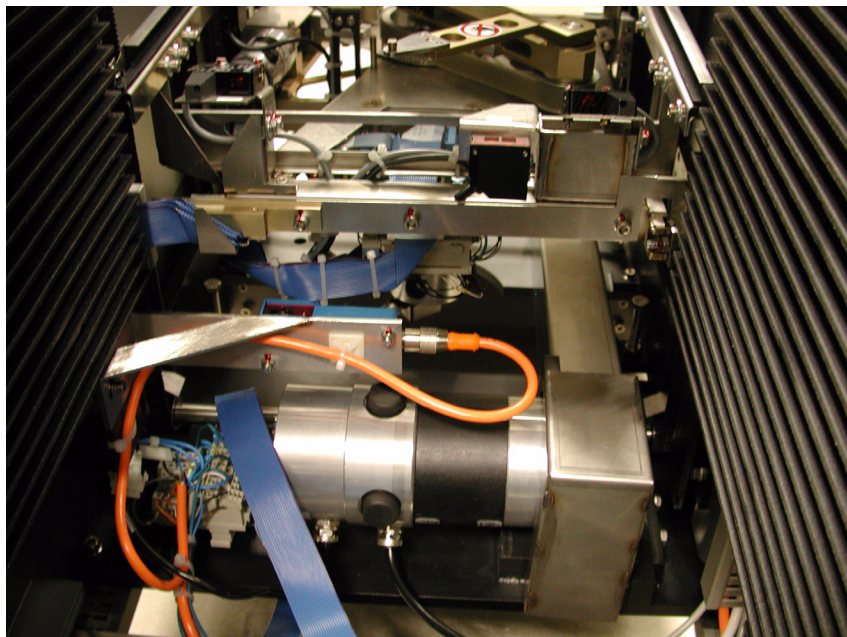


Figure 3 Lift motor

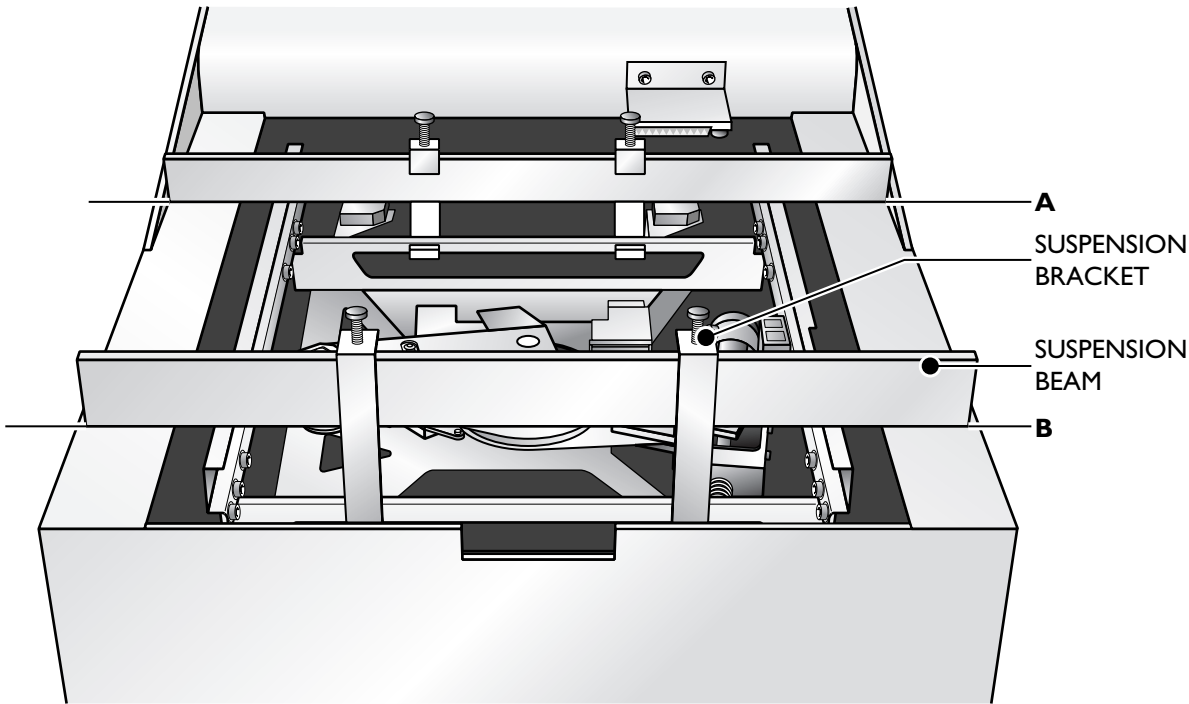


Figure 4 *Placing the suspension beams and brackets (ACM tray trolley shown)*

H8-00011.fm

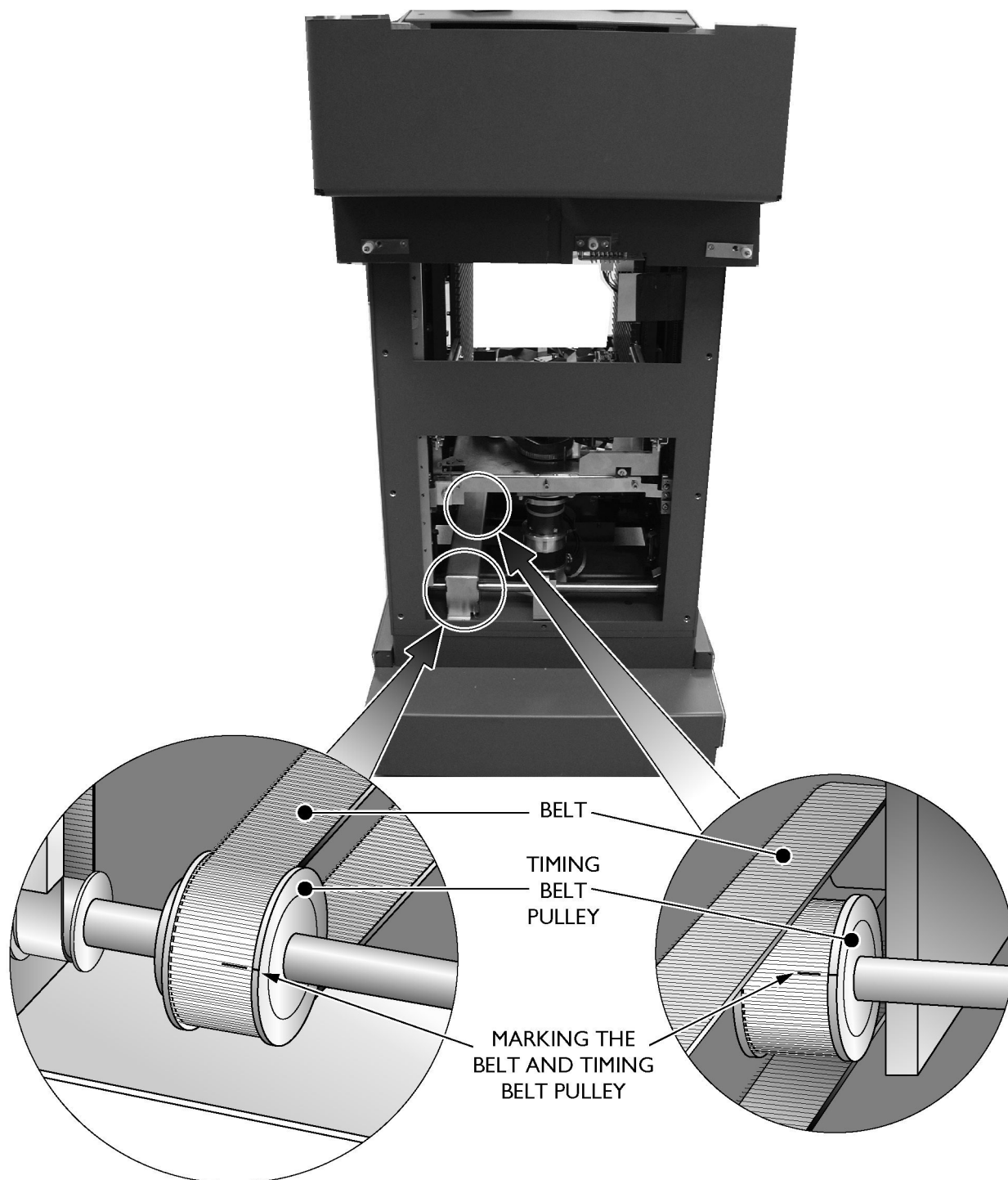


Figure 5 Marking the belts and timing belt pulleys of both axes

SD-158ff.eps

H8-00011.fm

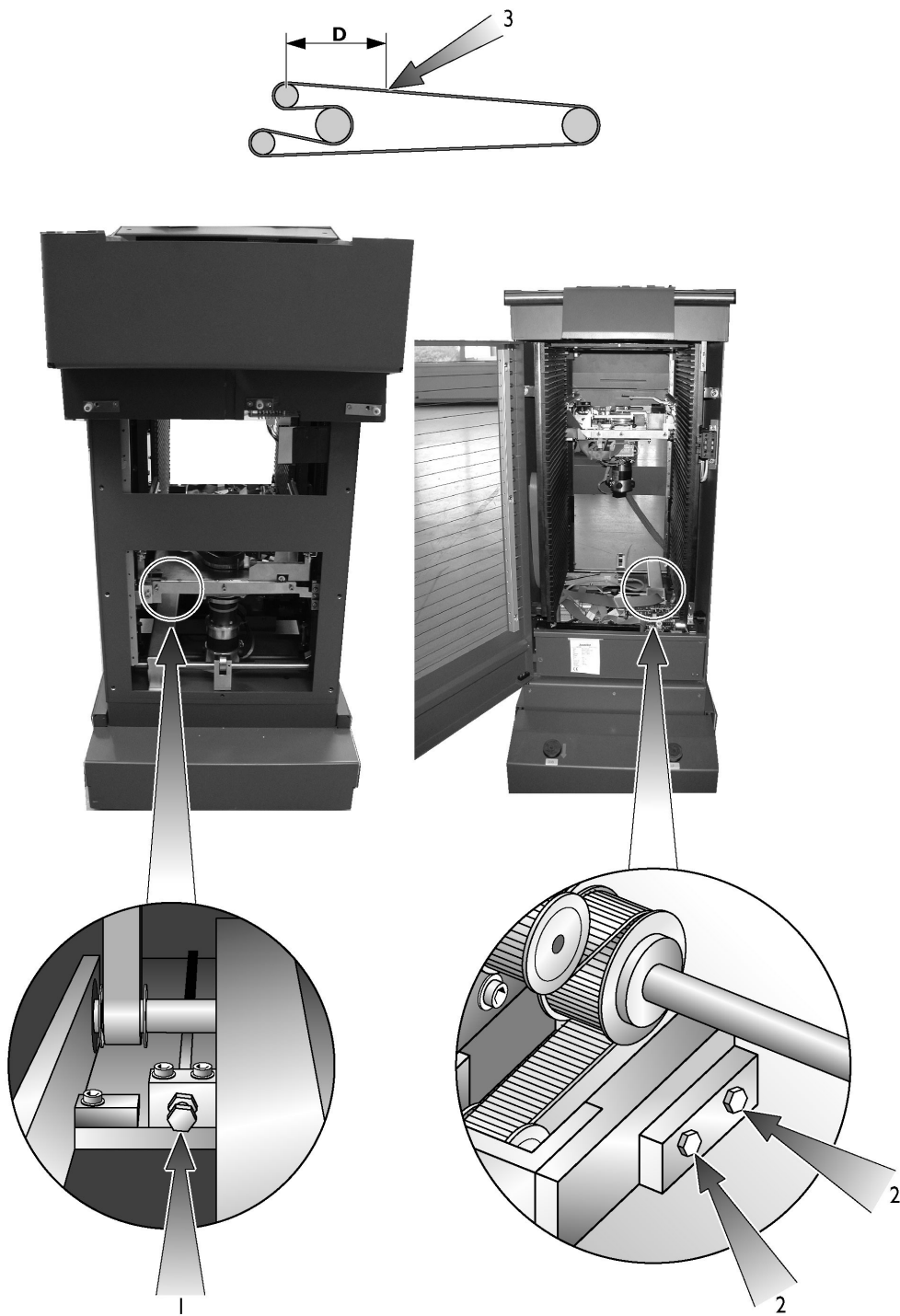


Figure 6 Location of the bolts of the belt tension adjuster

SD-170cc ill7.eps

H8-00011.fm

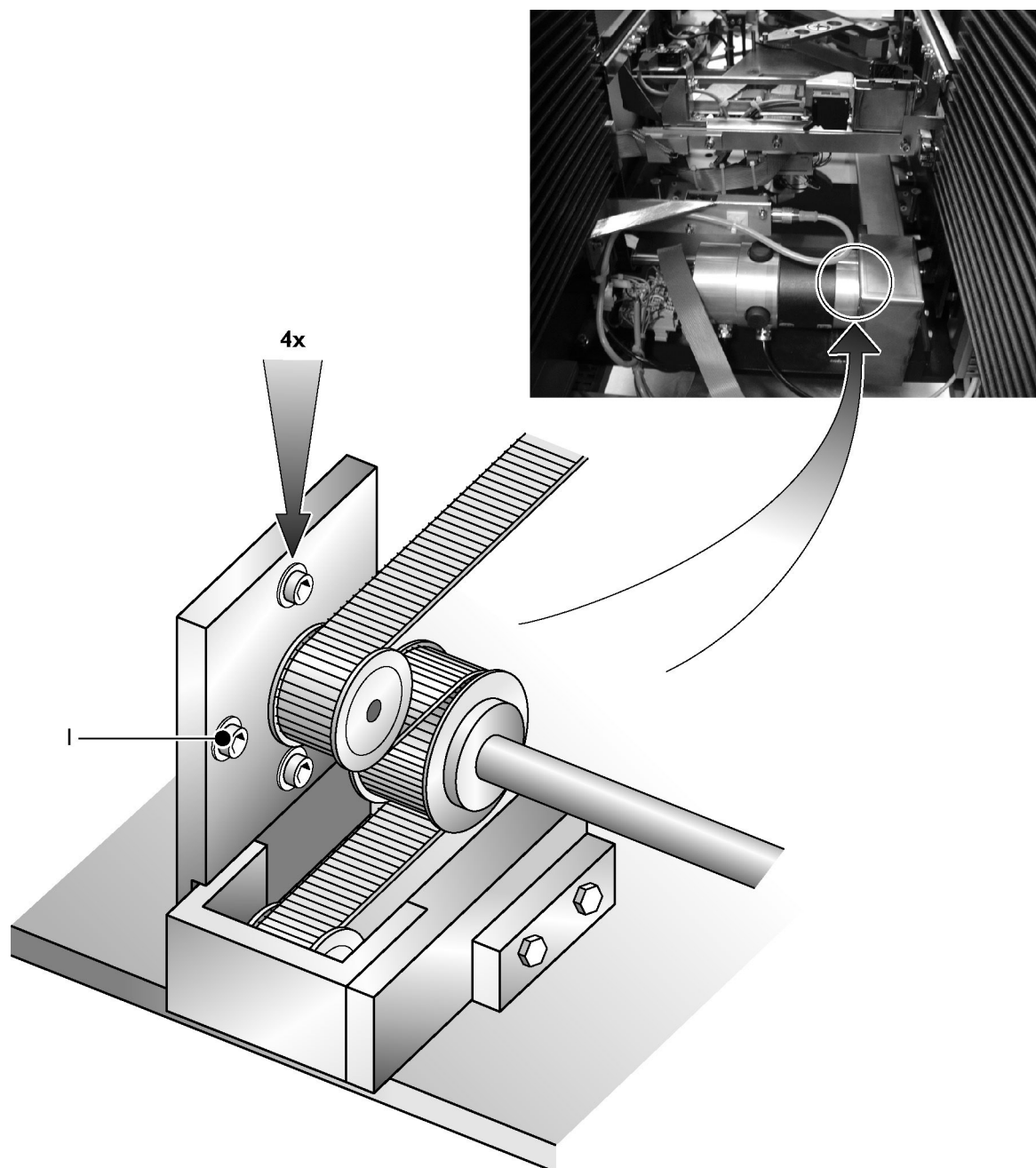


Figure 7 Location of the motor fastening bolts

SD-158g.eps

H8-00011.fm

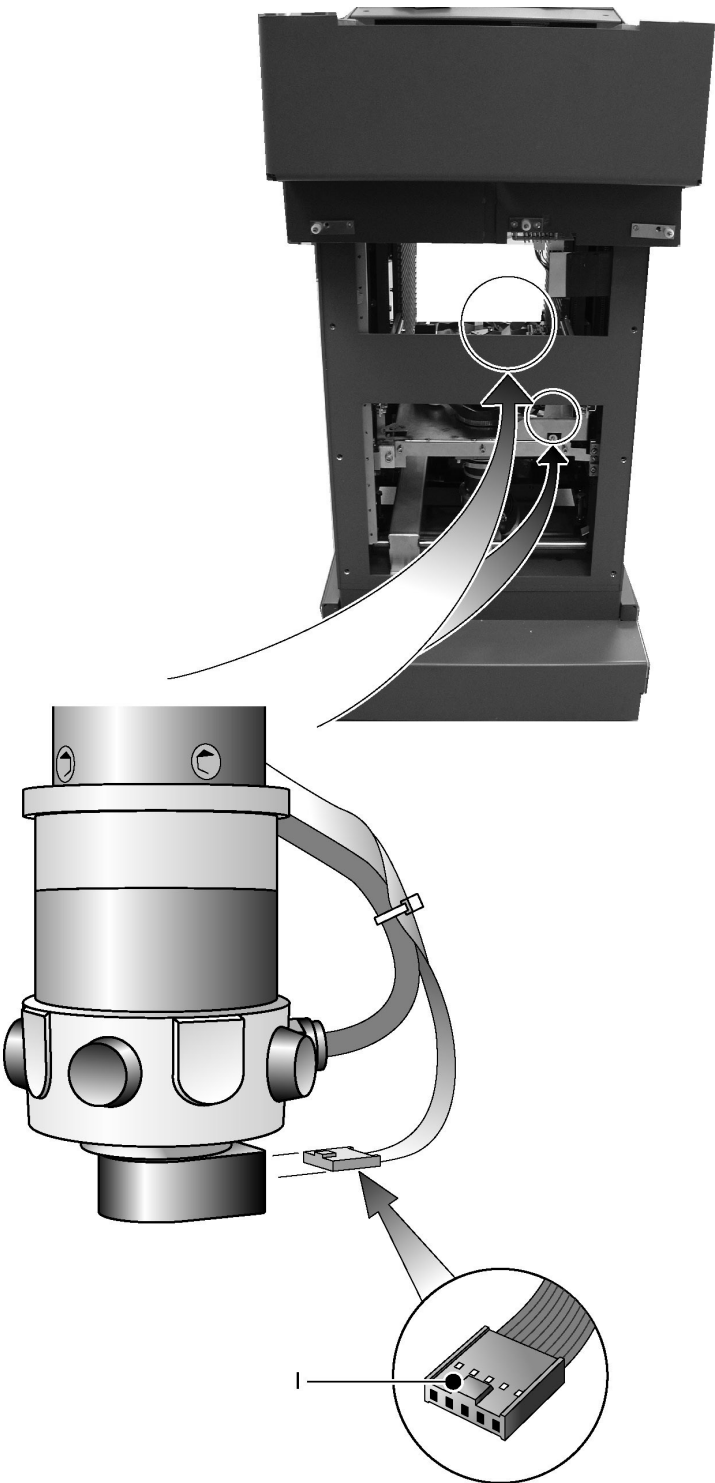


Figure 8 *Inserting the encoder plug*

SD-158mm ill7.eps

H8-00011.fm

H8.4 Snap-in motor, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). **H8.0.1.Tray trolley, spares**

9 describes how to remove the snap-in motor/encoder:

Action	Description	Figure
Switch the power off.		
Remove the motor encoder cable.		
Turn the motor axis to locate the very small screw (indicated with '1.' in 11) and loosen the screw with Allen key 0.9 mm.		see 11
Disconnect and remove the motor.		
Remove the square plate.		

Figure 9 Removing the snap-in motor/encoder

10 describes how to place a new snap-in motor/encoder.

Action	Description	Figure
Install a new snap-in motor/encoder.	Take care that the distance ('D' in 11) is $1 \pm 0,2$ mm and the square plate is mounted in the original position.	see 11
Adjust the snap-in zero coarse EPD (see section H6.11 Snap-in zero coarse EPD B10 adjustment for 'lock' position).		

Figure 10 Placing a new snap-in motor/encoder



Figure 11 Motor encoder

H8-00012.fm

H8.5 Drive belt of tray trolley lift, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). H8.0.1.Tray trolley, spares

1. Prerequisites

-
-

Release the bottom screws of the four contra-weight guide profiles, M5x10.

Each contra-weight has two guide profiles.

If the contra-weight is in front of the screws move the lift by using the external lift brake.

Put the lift in the up most position by using the external lift brake. Place the lift into four suspension brackets. Place one side of the brackets over the suspension beam and the other side underneath the lift.

3.Remove the controller box.

4.Release the tension of the four vertical belts by loosening the two screws, on the clamping plate left and right, and release the tension screws which can be reached through the holes on top of the trolley frame.

5.Release the tension of the white timing belt by loosening the two hexagonal bolts M6x25 from the clamping block (1), right from the lift motor (seen from the trolley handling site). Now release the tension of the timing belt by loosening the hexagonal screw M6. This is the screw that pushes against the clamping block. The clamping block holds the bracket (2) with the tension-pulley (3) in its place. Completely remove the two hexagonal bolts M6x25.

6.The timing belt can now be removed from the lift motor pulley. Pull the bracket, tension-pulley and clamping block towards you. Remove the clamping block from the bracket by removing the four socket screws M5x12.

7.The tension-pulley can be removed from the bracket by removing the shaft (4). Remove the shaft by using a punch. Watch out for the two spacer rings (5).

8.Remove the lift motor by removing the four socket screws M5x12 from the motor bracket.

9.Remove the four contra-weight guide profiles.

10.Remove the B06 sensor. This step only needs to be performed when the new B06 is installed, see Figure 1.

11.On the bottom of the tray trolley two bearing plates are placed, one on each side. Each bearing plate is mounted on the ground plate with two socket screws M5x20 and to the frame with two socket screws M6x20. Remove these screws and tilt the two main shafts until the left bearing plate (seen from the trolley handling site) can be removed from the ball bearing.

12.In order to remove the bearing plate four socket screws M3x16 (two at each ball bearing) need to be removed.

13.After taking one of the bearing plates the timing belt can easily be removed from the main shaft 1.

H8-00017.fm

2.3.2 Placing the new white timing belt

1. Place the timing belt around the tension-pulley (3) so the pulley and belt can be mounted back on the bracket (2). When replacing the shaft (4) make sure there is a spacer ring on both sides of the pulley. Note: Make sure that the belt is placed with the right side up, see figure 1.

2. Mount the clamping block (1) on the bracket by using four socket screws M5x12.

3. Replace the lift motor on the motor bracket with four socket screws M5x12. For the exact cable positions see fig. 7-27, Service Manual release 0101.

4. Place the timing belt around the main shaft 1 (closest to the rear side of the tray trolley). Make sure the timing belt goes underneath the pulley of the main shaft 2 (nearest to the lift motor).

5. Replace the bearing plate over the two bearing at the end of the main shafts and tighten it with four socket screws M3x16 (two at each ball bearing).

6. Place the construction of the bearing plates and the shaft back straight on the bottom of the tray trolley. Make sure that the front side of the bearing plates (seen from the trolley handling side) falls correctly over the dowels.

7. Tighten the bearing plates. Each bearing plate is mounted on the ground plate with two socket screws M5x20 and to the frame with two socket screws M6x20.

8. Mount the sub-assy (consisting of lift motor pulley, bracket and clamping block) on the mounting plate by using the two hexagonal bolts M6x25. The clamping block is mounted on the right block (seen from the trolley handling side) on the mounting plate. This is the block with the two slotted holes. Note: before mounting the sub-assy on the mounting plate make sure the timing is correctly placed on all the pulleys.

9. Replace the four contra-weight guide profiles. Each contra-weight has two guide profiles.

10. Before putting tension on the horizontal timing belt the lift has to be levelled. The main part can be done by rotating the main shaft 1 pulley when holding the belt in its place. This needs to be done visually.

11. Put tension on the horizontal timing belt, so the teeth of the belt can't move over the pulley. Now the lift stays in the same position and the suspension brackets can be removed. In order to remove the brackets the lift brake needs to be released. This can be done with external 24V. Do not remove the suspension beams but turn them 90 degrees. This way the suspension beams are laying flat on their side. After removing the suspension brackets the brake needs to be put back on the lift, make sure the lift is in the up most position.

12. Measure the height between the four lift corners and the suspension beam. When there is still a big difference in height between the front and the rear side of the lift the horizontal timing belt needs to be shifted one more teeth over the main shaft 1 pulley. When this tilts the lift too much, the height difference can be solved by shifting the teeth of the vertical belts over the pulleys. Tension needs to be put on the belts after shifting them.

13. The height difference between left and right can also be solved by shifting the vertical belts. When a small height difference remains, that can't be solved with the vertical belts, the lift can be adjusted with the two metal strips holding the lift up.

After adjusting all belts and putting them on tension the height between the lift corner and the suspension beam needs to be the same for all four corners.

14.Reconnect the controller box.

15.To check if the encoder is in the right position the encoder tester needs to be connected to the lift motor and the brake needs to be released from the lift. Hold the lift in the up most position and slowly move the lift manual down. Mark the height of the contra-weight on the side panel when the first encoder pulse is present. Move the lift further down and check when the B06 sensor is just activated. When the sensor is just activated again mark the height of the contra-weight. Finally move the lift further down till the second encoder pulse is present and mark the height of the contra-weight. The encoder is in the right position when the mark of the activated B06 sensor is in between the two marks of the encoder pulses (see picture below).

16.When there are two encoder pulses before the B06 sensor is just activated or when the sensor is just activated within a distance of 1/4x of the first or second encoder pulse it means that the lift encoder is not in the right position. Rotating the lift pulley can solve this.

17.Before rotating the lift pulley the horizontal belt and both main shaft pulleys need to be marked. Release the tension of the horizontal belt and loose the four socket screws M5x12 on the lift motor so the lift pulley can be rotated.

18.After tightening the lift motor make sure that the lift is straight by checking the marks on the pulleys and belt.

19.When both the lift is straight and the lift encoder is in the correct position the right tension can be put on all the belts. For the horizontal belts the tension needs to be in between 58Hz - 62Hz when measuring by the lift motor pulley (see Figure 14). For the vertical belts the tension needs to be in between 78Hz - 82Hz when the distance from the centre of the bottom pulley till the counter weight is 0.3m (see Figure 14). The tension can be measured with a frequency meter.

20.Calibrate the lift.

•

2. Replace drive belt

•

3.

- Adjust, see [H6.18 Drive belt of tray trolley lift, adjustment](#)

H8.6 Puller drive belt, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). [H8.0.1.Tray trolley, spares](#)

1. Prerequisites

-

2. Replace puller motor timing belt

-

-

3. Finalize

- Adjust the belt tension, see [H6.19 Puller motor timing belt, adjustment](#)

H8.7 Vertical timing belt in tray trolley, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). **H8.0.1.Tray trolley, spares**

1. Prerequisites

-

WARNING: Do not cut the belt in two

1.Put the lift in such a position that it is easy to reach the clamping system

2.Mark all pulleys and the vertical belts so that the new belt is easier to replace.
Also mark the vertical timing belts where they are being clamped by the clamping system and on the counter weights.

3.Release the tension of the belt that needs to be removed and the second belt on the same side. For example when replacing belt 1 release the tension of belt 1 and 3.

4.**WARNING:** Make sure that there is a little plate at the bottom of the linear guide. If there isn't a metal plate put a little piece of tape around the bottom of the linear guide so the slide can not fall off.

5. Remove the ball joint from the plate, on the slide of the linear guide, by removing the socket screw M6x20.

6. Remove the cable interface of the puller by removing the socket screws M5x16 and M5x10 and the two socket screws M2.5.

7. Remove the ball joint from the slide of the linear guide by removing the torque screw.

8.Loosen the connecting plate from the clamping system by removing the two socket screws M4x10.

9.Release the belt from the clamping system. The clamping system

consists of one clamping plate, two clamping blocks and two set

plates. By removing the four socket screws M4x12 the system can be removed from the belt.

10.Release the belt from the counter weight by removing six socket screws M3x12 from the clamping plate. Note: Make sure the belt is marked at the position the belt is being clamped against the counter weight.

11.Remove the vertical belt.

2.4.2Placing the new vertical belt

1.Mark the new belt. Use the old vertical belt to mark the new belt in the same way. Make sure the new belt has the same length (same amount of teeth). Fold the belt at the position of the marking where the set plate has to be positioned.

2.Place the belt around the two pulleys.

3.Mount the clamping system on one of the sides of the belt. It is easiest to clamp the topside of the belt first and than the bottom side. Make sure the belt is in the right position according to the marks.

4.Clamp the belt against the counter weight, using the clamping plate which can be

H8-00016.fm

mounted with 6 socket screws M3x12. Watch the marks.

5.If the marks on the belt and on the pulleys are not in the same position the belt needs to be shifted over the pulleys until they are the same.

6.Check if the second belt, which has been released of tension, is still in the correct position. If not shift the belt over the pulleys. For example when replacing belt 1 check if belt 3 is still in the correct position.

7.Mount the connecting plate rear back on the clamping plate by using the two socket screws M5x10.

8.1Reconnect the ball joint and the plate on the slide of the linear guide. Make sure the distance between the side of the linear guide and the black guide strip is 4mm ± 0.1 (see picture).

9.2Replace the cable interface of the puller using the socket screws M5x16 and M5x10 and the two socket screws M2.5.

10.3Reconnect the ball joint and slide by replacing the torque screw. Before tightening the screw make sure the lift guide strip runs parallel to the right guide wall (seen from the handling side). The distance between the back of the guide wall and the lift frame needs to be 65mm.

11.Put tension on the two vertical belts, approximately the same as the two other belts that are still on tension. For example when replacing belt 1 the tension needs to be put on belt 1 and 3 and needs to be equal to belt 2 and 4.

12.Put the lift in such a position that it is easy to measure if it is levelled. This can be done by releasing the brake by using the external 24V.

13.Measure if the lift is standing levelled. If the lift is not straight it needs to be corrected. This can be done either by shifting the teeth of the belt over the pulley or by adjusting the connection plate.

14.When the lift is completely straight the right tension can be put on the belts. The vertical belt tension needs to be 78Hz-82Hz when the distance from the centre of the bottom pulley till the counter weight is 0.3m (see Figure 14).

15.Calibrate the lift.

NOTE: When replacing all four vertical belts it is easiest to remove the entire lift module (lift, puller module and snap-in)

2. Finalize

- Adjust, see [H6.17 Vertical lift belt, adjustment](#)

H8-00016.fm

H8.8 Cranck puller, replacement

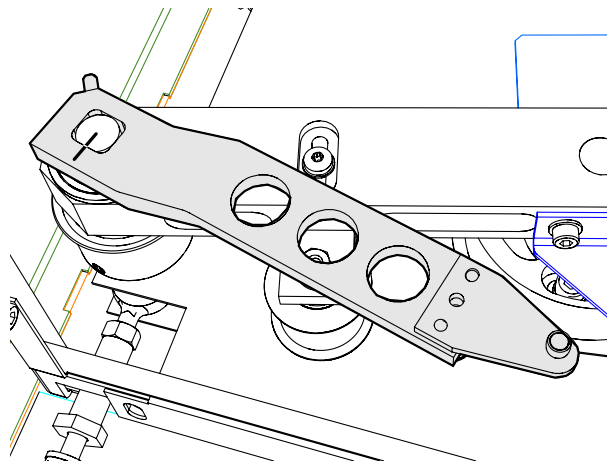
Estimated time to complete [min.]:

Required special tools.

Required part(s). **H8.0.1.Tray trolley, spares**

1. Adjustment

- Mark position existing cranck puller;
- Remove cranck puller;
- Install a new cranck puller;
- Check height of puller arm tip according to the procedure in section, see **H6.14 Puller arm tip, height adjustment** .



H8-00005.fm

H8.9 Puller catch pin, replacement

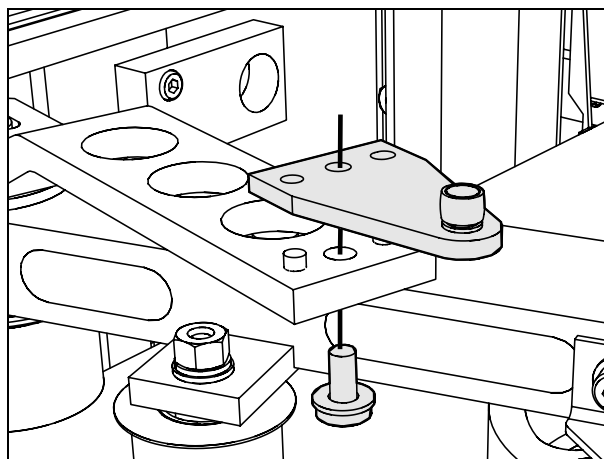
Estimated time to complete [min.]:

Required special tools.

Required part(s). [H8.0.1.Tray trolley, spares](#)

1. Adjustment

- Make sure that the two dowels and the screw of the arm do not extrude above the surface of the puller catch pin plate.
- Check height of puller arm tip according to the procedure in section, see [H6.14 Puller arm tip, height adjustment](#)



H8-00003.fm

H8.10 Contact pins on tray trolley, replacement

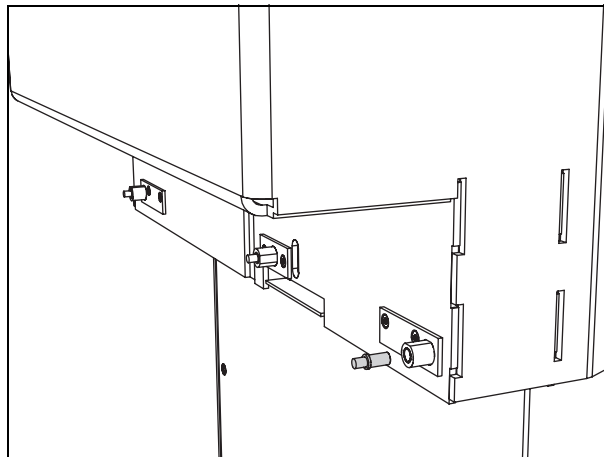
Estimated time to complete [min.]:

Required special tools.

Required part(s). **H8.0.1.Tray trolley, spares**

1. Replace a contact pin

- Replace a contact pin using pliers.
- Push the new contact pin into the housing.



H8-00018.fm

H8.11 Trolley interface board, replacement

Estimated time to complete [min.]:

Required special tools.

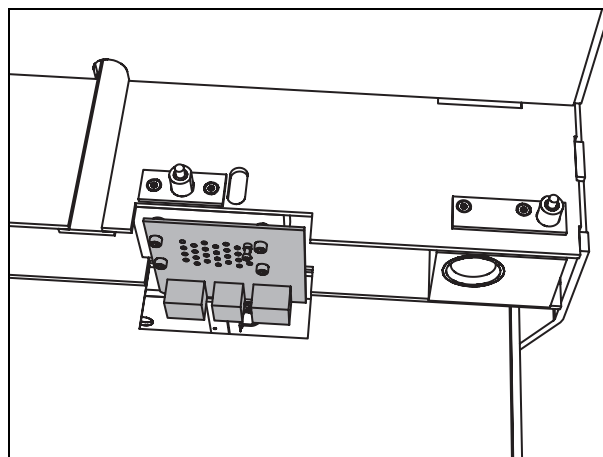
Required part(s). [H8.0.1.Tray trolley, spares](#)

1. Prerequisites

-

2. Replace the trolley interface board

- Remove the four Allen bolts that fasten the board.
- Disconnect all cables to the board.
- Installation in reverse order.



H8.12 Control LED's on tray trolley, replacement

Estimated time to complete [min.]:

Required special tools.

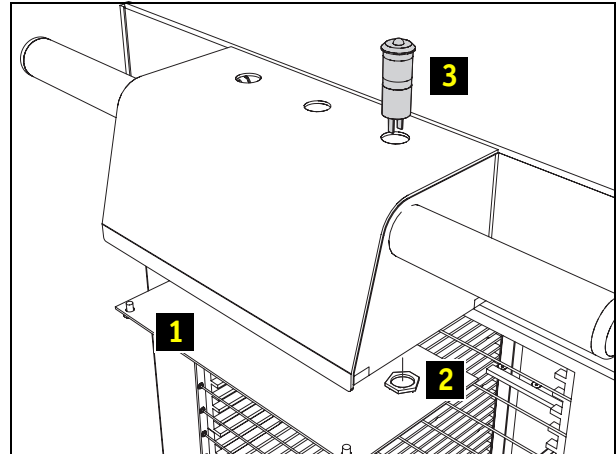
Required part(s) H8.0.1.Tray trolley, spares

1. Prerequisites

- Power down the machine.

2. Replace the control LED

- Remove cover (1).
- Locate concerning LED and disconnect wiring.
- Remove nut (2).
- Take out LED.
- Installation in reverse order.



H8-00006.fm

H8.13 Driver board of puller motor, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). H8.0.1.Tray trolley, spares

1. Prerequisites

- Power down the machine.
- Remove cover plate (1).

2. Remove driver board

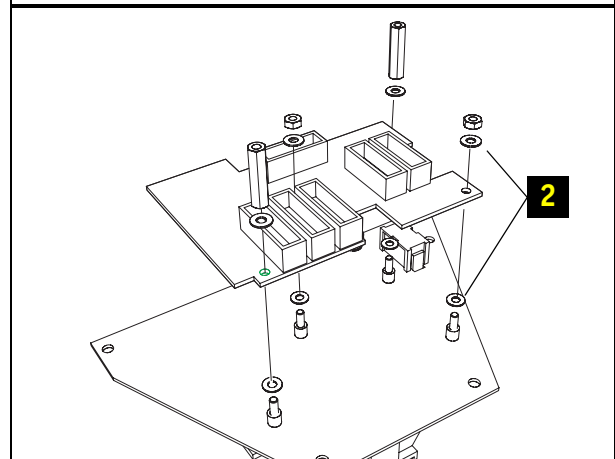
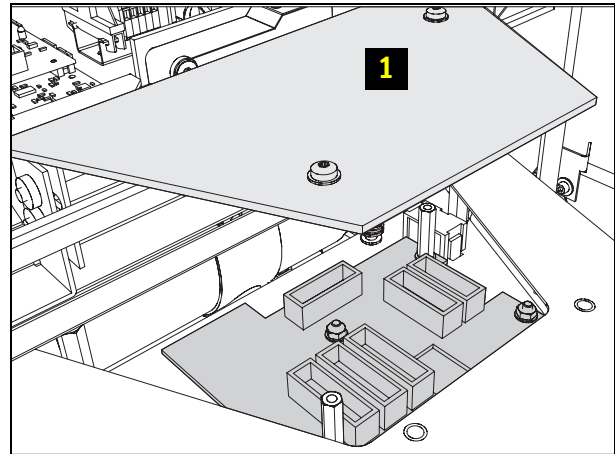
- Remove connectors.
- Loosen studs and screws.
- Take out driver board.

3. Install driver board

- Mount the new driver board.
- Apply the isolating fibre washers (2).
- Connect connectors.

4. Finalize

- Mount the cover plate (1).



H8.14 Safety interlock in tray trolley, replacement

Estimated time to complete [min.]: ?

Required special tools. -

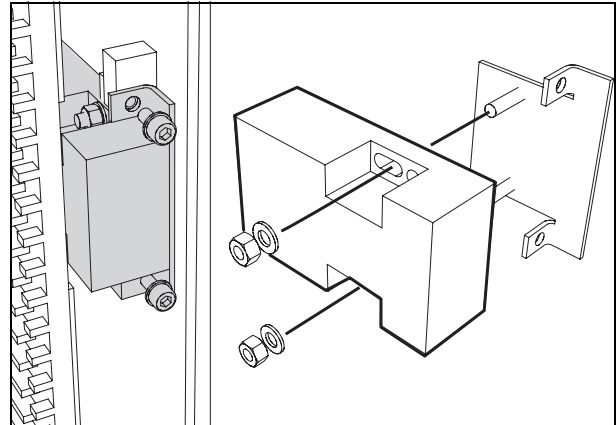
Required part(s). H8.0.1.Tray trolley, spares

1. Prerequisites

- Open the front door of the tray trolley.

2. Replace safety contact

- Loosen two screws and take safety interlock with bracket out.
- Disconnect wiring.
- Transfer bracket to new safety contact.
- Connect wiring and mount safety interlock.
- Check function.
- Adjust if necessary.



H8-00009.fm

H8.15 EPD B01, B02 in tray trolley, replacement

Estimated time to complete [min.]:

Required special tools.

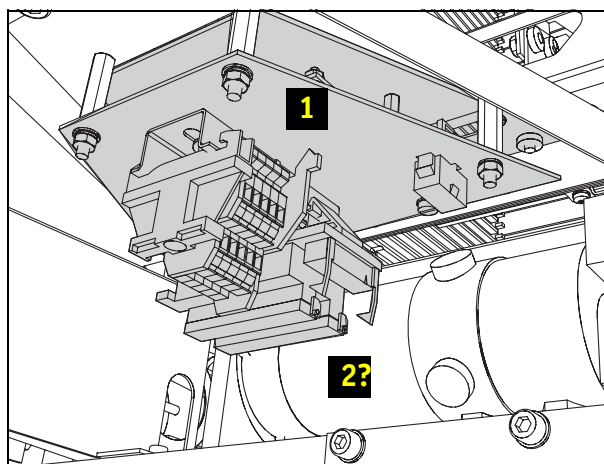
Required part(s). [H8.0.1.Tray trolley, spares](#)

1. Prerequisites

- Power down the machine.
- Remove the cover at the back of the machine.

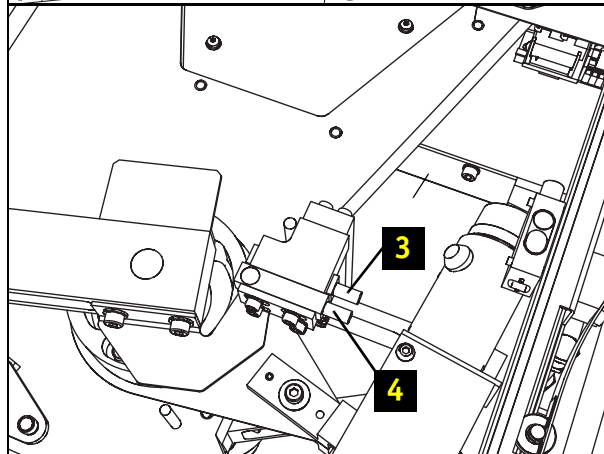
2. Remove connector of EPD B01,B02

- Loosen mounting plate driver board (1).
- Cut tie-wrap and locate wiring of concerning EPD (2?).



3. Replace the EPD B01, B02

- Loosen the nut and take EPD B02 (3) or EPD B01 (4) out.
- Connect EPD connector (2?).
- Mount mounting plate driver board (1).
Apply Loctite 232.



4. Finalize

- Secure the cables with a tie-wrap
- Adjust EPD B01, see [H6.3 EPD B01 puller in stock area, adjustment](#)
- Adjust EPD B02, see [H6.4 EPD B02, puller safe / puller zero coarse adjustment](#)

H8-00010.fm

H8.16 Tray carrier sensor B03, B04, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). [H8.0.1.Tray trolley, spares](#)

1. Prerequisites

-
-

2. Distance threshold adjustment sensor B03,

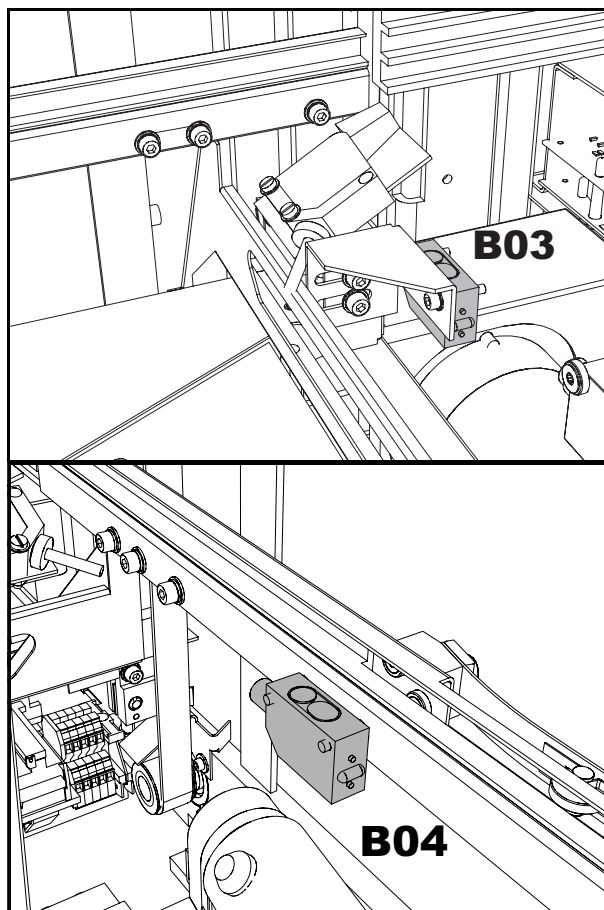
-

3. Sensor position, sensor B03 only

-

4. Finalize

- Adjusting, see [H6.5 Tray carrier sensor B03, B04 adjustment](#)



H8-00007.fm

H8.17 Laser B05, sensor storage in tray trolley, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). [H8.0.1.Tray trolley, spares](#)



LASER BEAM

Looking into it may injure your eyes.
Do not stare into it

1. Prerequisites

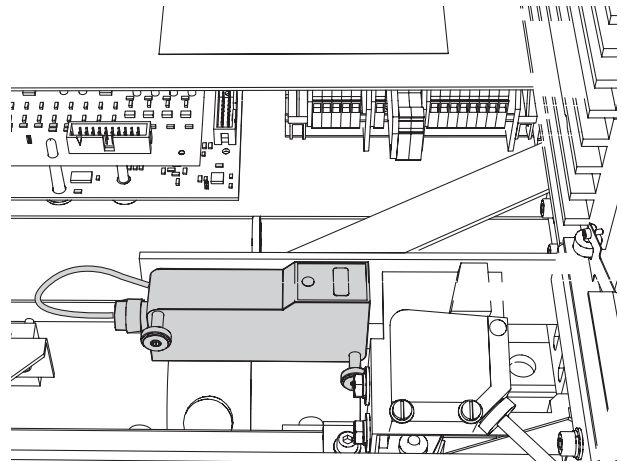
-

2. Replace sensor

-
-
-

3. Finalize

- Adjust laser sensor, see [H6.6 Laser B05, sensor storage in tray trolley, adjustment](#)



H8.18 EPD B06 in tray trolley, replacement

Estimated time to complete [min.]: ?

Required special tools. ?

Required part(s). **H8.0.1.Tray trolley, spares**



NOTE: The sensor can be mounted in two ways on the tray trolley depending on the status of the trolley. It can either be pointing with the LED up or with the LED pointing towards the storage area. Adjustment of the sensor stays the same.

1. Prerequisites

- ?

2. Replace EPD (B06)

- In the highest position (with the counterweights against the end stops) the sensor must be activated.

Note: To check this there is a small LED (1?) on the sensor.

3. Finalize

- Adjust, see **H6.7 EPD B06 in tray trolley, adjustment**
-



H8-00024.fm

H8.19 Laser B07, storage in tray trolley, replacement

Estimated time to complete [min.]:

Required special tools.

Required part(s). H8.0.1.Tray trolley, spares

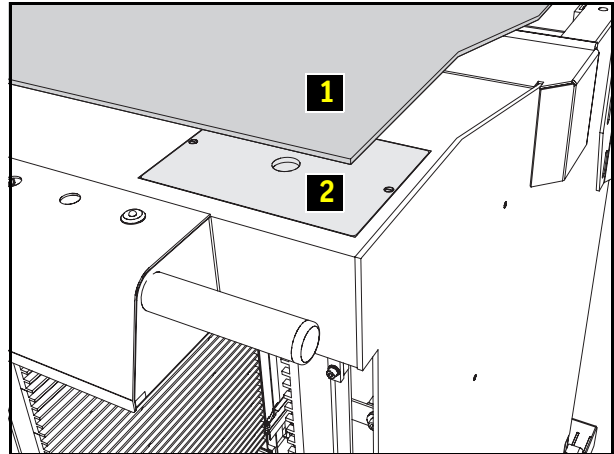


LASER BEAM
Looking into it may injure your eyes.
Do not stare into it



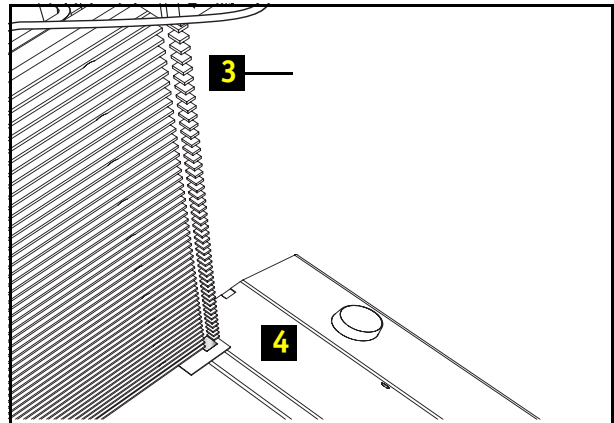
1. Prerequisites

- Remove covers (1,2).



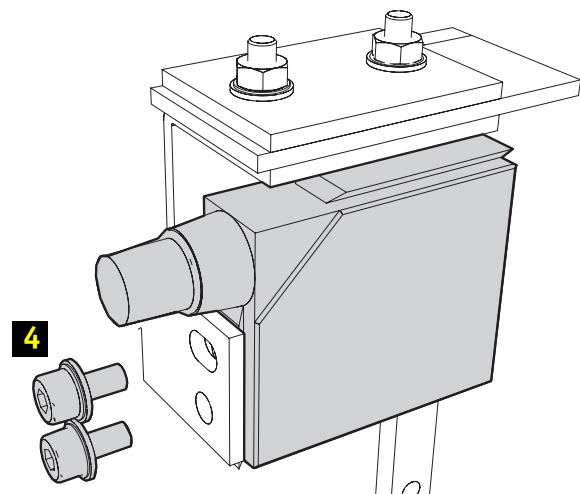
2. Remove laser with bracket

- Disconnect wiring (3) of laser.
- Remove the bolts (4) and take bracket with laser out.



3. Transfer bracket

- Remove the bolts (4) and take sensor off.
- Position the new sensor according the old one.



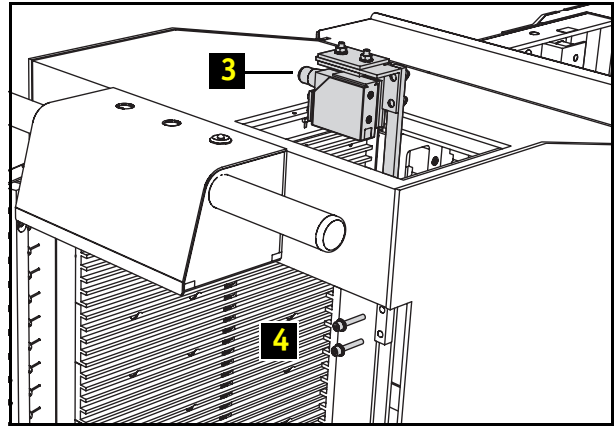
H8-00023.fm

4. Mount laser with bracket

- Connect wiring (3) of laser.
- Install the bracket with laser with the two (4) bolts.

5. Finalize

- Adjustment, see [H6.9 Laser B07, sensor storage in tray trolley, adjustment](#)
- Installation of covers (2,1) in reverse order.



H8.20 Light sensors B08,B09 in tray trolley, replacement

Estimated time to complete [min.]:

Required special tools

Required part(s) [H8.0.1.Tray trolley, spares](#)

1. Prerequisites

- Power down the machine.
- Remove the cover at the back of the machine.

2. Remove connector of B08,B09

- Loosen mounting plate driver board (1).
- Cut tie-wrap and locate wiring of concerning EPD (2?).

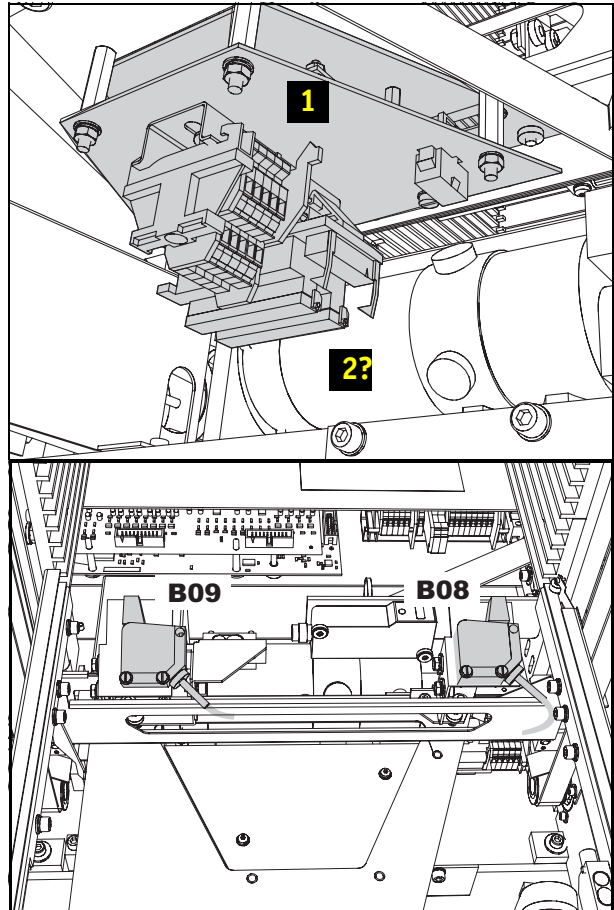
-
-
-
-
-
-
-

3. Replace B08, B09

-
-
-

4. Finalize

- Adjust see [H6.10.Light sensor B08, B09, carrier detection adjustment](#)



H8.21 EPD B10 in tray trolley, replacement

Estimated time to complete [min.]:

Required special tools.

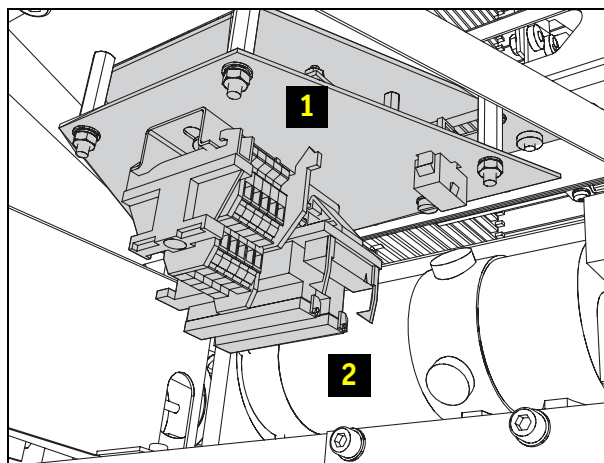
Required part(s). **H8.0.1.Tray trolley, spares**

1. Prerequisites

- Power down the machine.
- Remove the cover at the back of the machine.

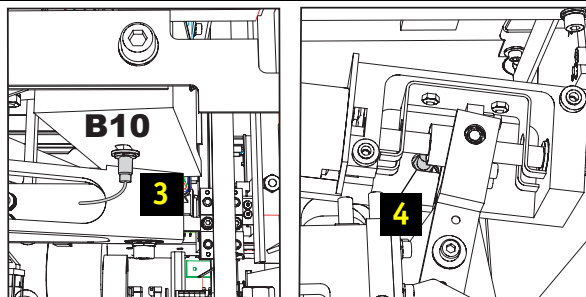
2. Remove connector of EPD B10

- Loosen mounting plate driver board (1).
- Cut tie-wrap and locate wiring of concerning EPD (2).



3. Replace the EPD B10

- Loosen the nut and replace EPD (3).
- Connect EPD connector (2).
- Mount mounting plate driver board (1).
Apply Loctite 232.
- Gap (4) between sensor and bracket 0.5 ± 0.2 mm.



4. Finalize

- Secure the cables with a tie-wrap.
- Adjust EPD, see **H6.11 Snap-in zero coarse EPD B10 adjustment for 'lock' position**

H8.22 Foot switch of tray trolley, replacement

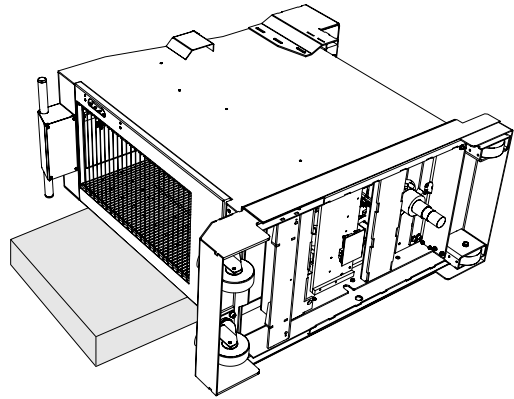
Estimated time to complete [min.]: ?

Required special tools. -

Required part(s). [H8.0.1.Tray trolley, spares](#)

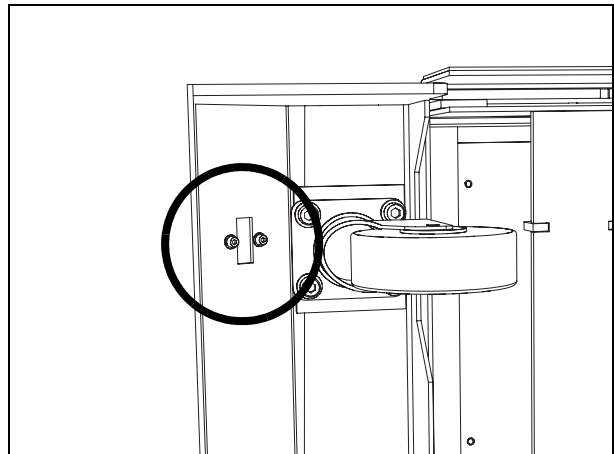
1. Prerequisites

- Place the tray trolley on its side on a pallet cart or on two wooden bars (prepare the surface so the that the trolley doesn't get scratched).



2. Replace the trolley foot switch

- Cut the tie wraps that keep the foot switch cable in place.
- Remove the foot switch (2 Allen bolts and 1 cable).
- Installation in reverse order.



H8.23 Wheels under tray trolley, replacement

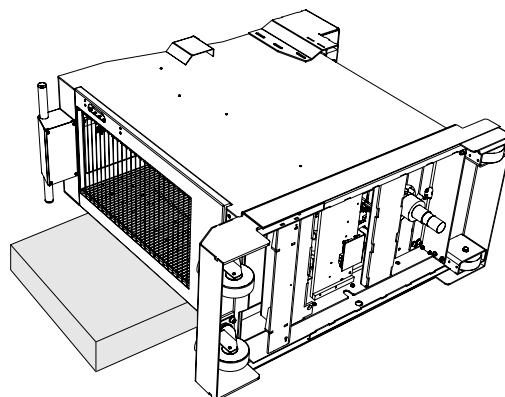
Estimated time to complete [min.]: ?

Required special tools. -

Required part(s). **H8.0.1.Tray trolley, spares**

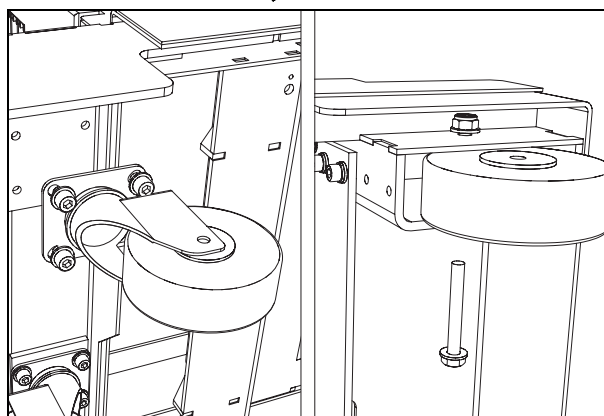
1. Prerequisites

- Place the tray trolley on its side on a pallet cart or on two wooden bars (prepare the surface so the that the trolley doesn't get scratched).



2. Replace the trolley wheels

- Remove the (swivelling) wheels.



H8-00021.fm

I. FLUXER

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CHAPTER I1 Introduction

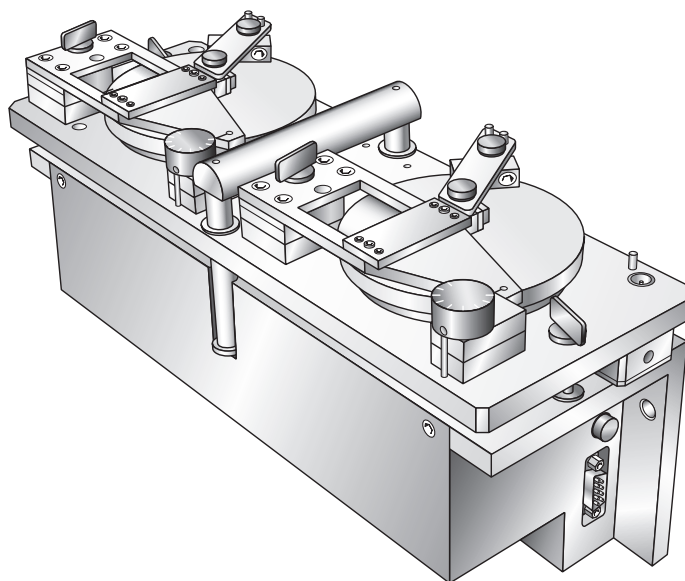


Figure 1 Flux applicator

The Flux applicator unit is a double applicator of thin film flux to flip-chip type components just before placement.

The flux is used to clean the surface to be soldered and to keep the flip-chip in position between the placement and soldering process. Two components can be fluxed simultaneously.

CHAPTER I2 Safety

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CHAPTER I3 Specifications

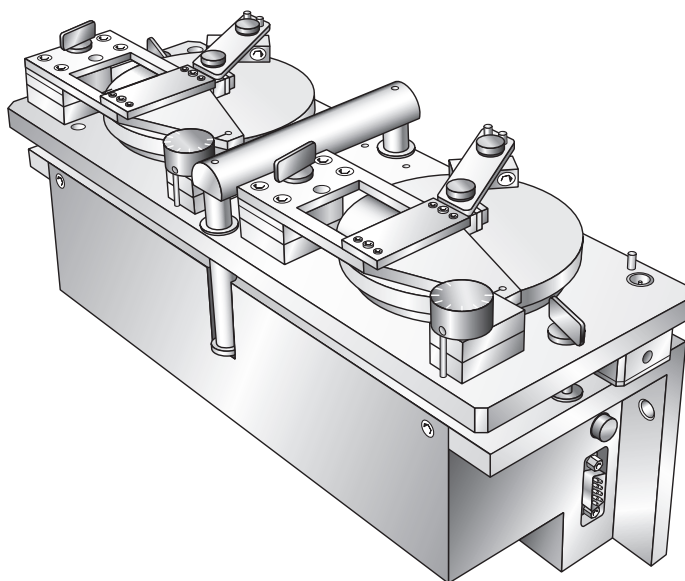


Figure 2

The Flux applicator is an optional unit to the D-9 placement system.

- Flux applicator front: PA2679/10
- Flux applicator rear: PA2679/00

CHAPTER I4 Functional description

I4.1 Fluxer, functional description

The basic concept is a metal squeegee mounted an adjustable distance above a rotating disk. As the disk turns, a thin layer of flux is spread onto the disk by the squeegee. The speed of the disk is manually adjustable between 0 - 20 rpm.

Two wipers re-gather the flux. The position of the wipers is adjustable manually. The flux type and the gap between the disk and the squeegee determines the layer thickness of the flux on the disk. The gap is adjustable stepless between 20 and 220 μm which results in a flux layer thickness between 20 and 120 μm . The squeegee keeps the flux moving to assure homogeneity. To control the amount of flux applied to the solder balls of the flip-chip, the disk momentarily stops rotating during dipping.

To avoid dust particles falling into the flux, the Flux Applicator is provided with a dust cover.

I4.2 Flux layer thickness, measuring tool

The layer thickness of the flux depends not only on the gap between the disk and the squeegee but also on the type of flux that is used.

Therefore control of the flux layer thickness is necessary. For this, two special measuring tools (20 - 60 μm and 70 - 120 μm) can be used to monitor the real flux layer thickness on the disk.

The tools are rectangular pieces of hardened steel with reference poles at the corners and a matrix of poles of different length in the centre.

The difference in length between the poles is 10 μm . By dipping the tool into the flux, one can see which poles touch the flux and determines the flux layer thickness.

I4.3 Interfaces

I4.3.1 Mechanical interface

The flux applicator at the front, is placed on a special bracket.

I4.3.2 Electrical interface

The interfaces from the I/O signals to the Flux applicator.

3 signals can be sensed:

- Output 'Claim fluxer': 'high' when the fluxer is claimed by the system for dipping (disk must stop);
 - Input 'fluxer ready': 'high' when the fluxer is ready for dipping (disk is stopped);
 - Input 'cover placed': 'high' when the cover is placed.

I4.3.3 Software interface

To start the dipping process, the following sequence will be valid:

- The cover of the Flux Applicator is placed and the output 'cover placed' is 'high';

- The disk of the Flux Applicator is rotating continuously;
- The system set output 'claim fluxer' to 'high';
- As a result of this, the Flux Applicator will stop the disk and set the input 'fluxer ready' to 'high';
- The system will lower the Placement Head(s) until the required bump contact force (dip force) is reached;
- The system waits for a pre-defined time (dip time);
- The system will raise the Placement Head(s);
- The system set output 'fluxer claim' to low;
- As a result of this the 'Flux Applicator' will restart the disk and sets the input 'fluxer ready' to low.

CHAPTER I5 Troubleshooting

I5.1 Troubleshooting workflow

I5.2 Troubleshooting workflow

The troubleshoot chapter is structured around 3 main questions to help troubleshooting the machine:

1. What must I do when? Make the right decision with help of the diagnosis tree.
2. How must I do it? Get the right answers with the right procedures.
3. Where can I find specific information? Get the technical details to be able to retrieve the right answer from the procedure.



NOTE: Using the electronic version of the manual will enable the user to use hyperlinks and the 'back' button in the browser to navigate quickly through the information in separate paragraphs.

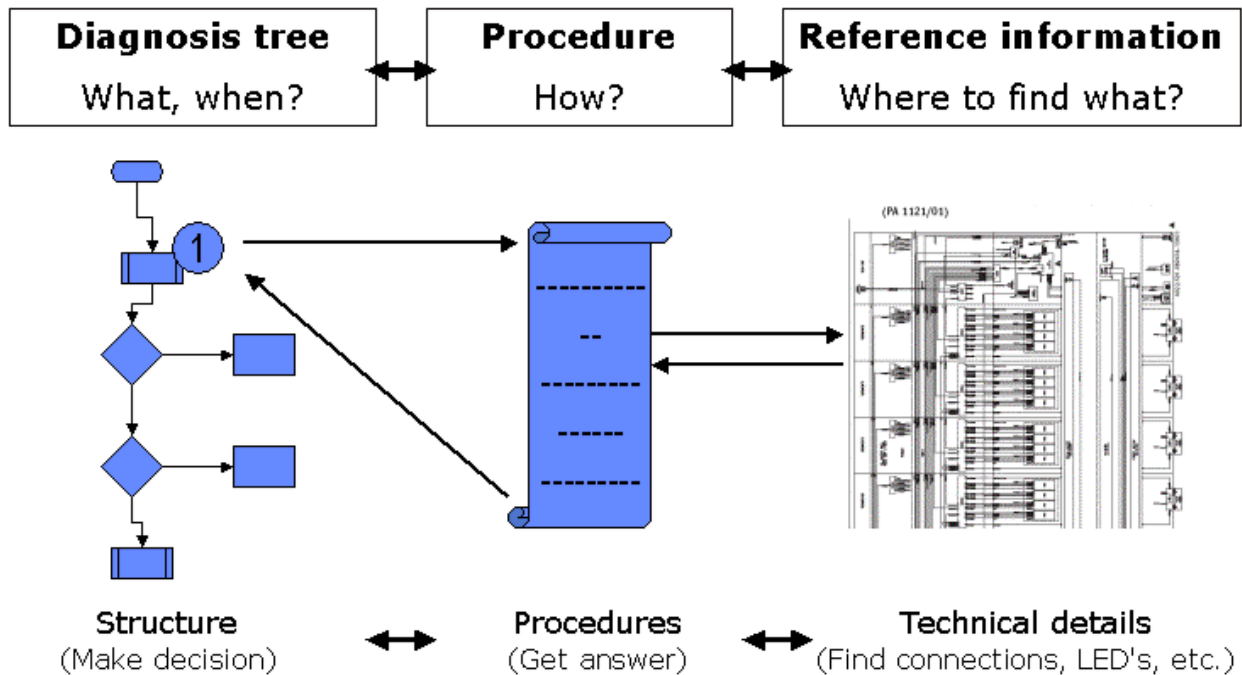
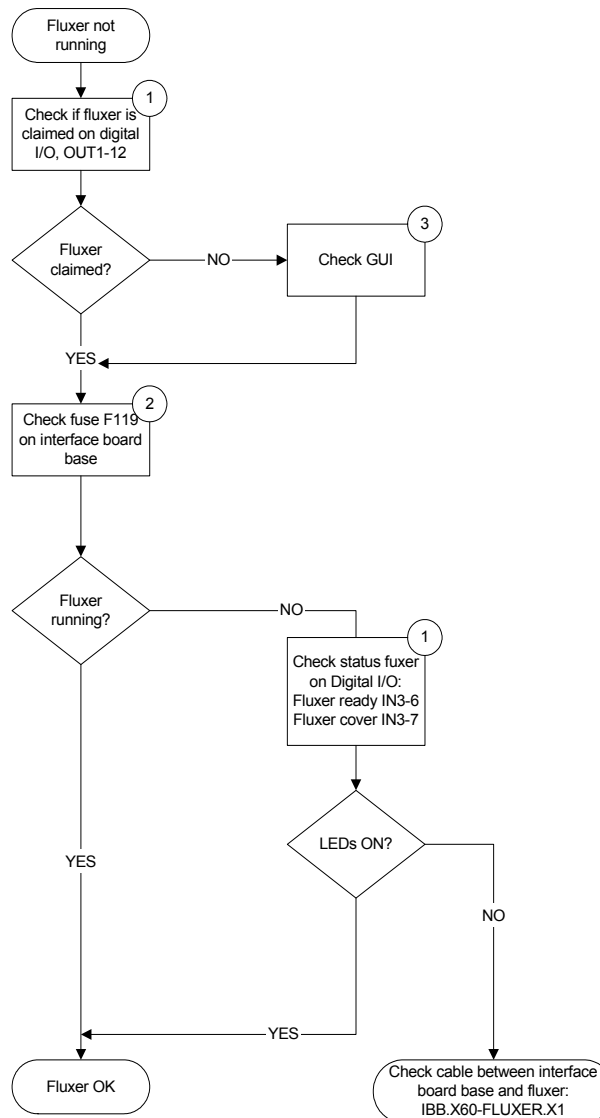


Figure 3 Visual structure of chapter 5

I5.3 Diagnosis trees and tables

I5.3.1 Fluxer not running, diagnosis tree



Reference:

1. [B5.3.9.4 Digital I/O, LED signalling](#) .
2. [B5.3.11 Interconnection board base, fuses and LED signalling](#)
3. User Reference Manual.

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Figure 4 Fluxer not running

I5.4 Reference information

I5.4.1 Fluxer, controller connections

PIN	SIGNAL
1	+ 24V dc
2	To input 'fluxer ready'
3	Gnd
4	+ 24V dc
5	To input 'cover placed'
6	Gnd
7	From output 'claimed fluxer'
8	Not connected
9	Not connected

Figure 5 Connections X1

PIN	SIGNAL
1	Gnd
2	+V motor
3	CW / CCW
4	start / stop
5	+V logic
6	velocity signal

Figure 6 Connections M1 and M2

I5.4.2 Fluxer, interconnections

PIN	PIN	FUNCTION
IBB.X60-7	FLUXER.X1-7	Output 'Claim fluxer'
IBB.X60-2	FLUXER.X1-2	Input 'Fluxer ready'
IBB.X60-5	FLUXER.X1-5	Input 'Cover fluxer'

Figure 7 Interconnections between fluxer and interface board base

I5.5 Fluxer, diagrams

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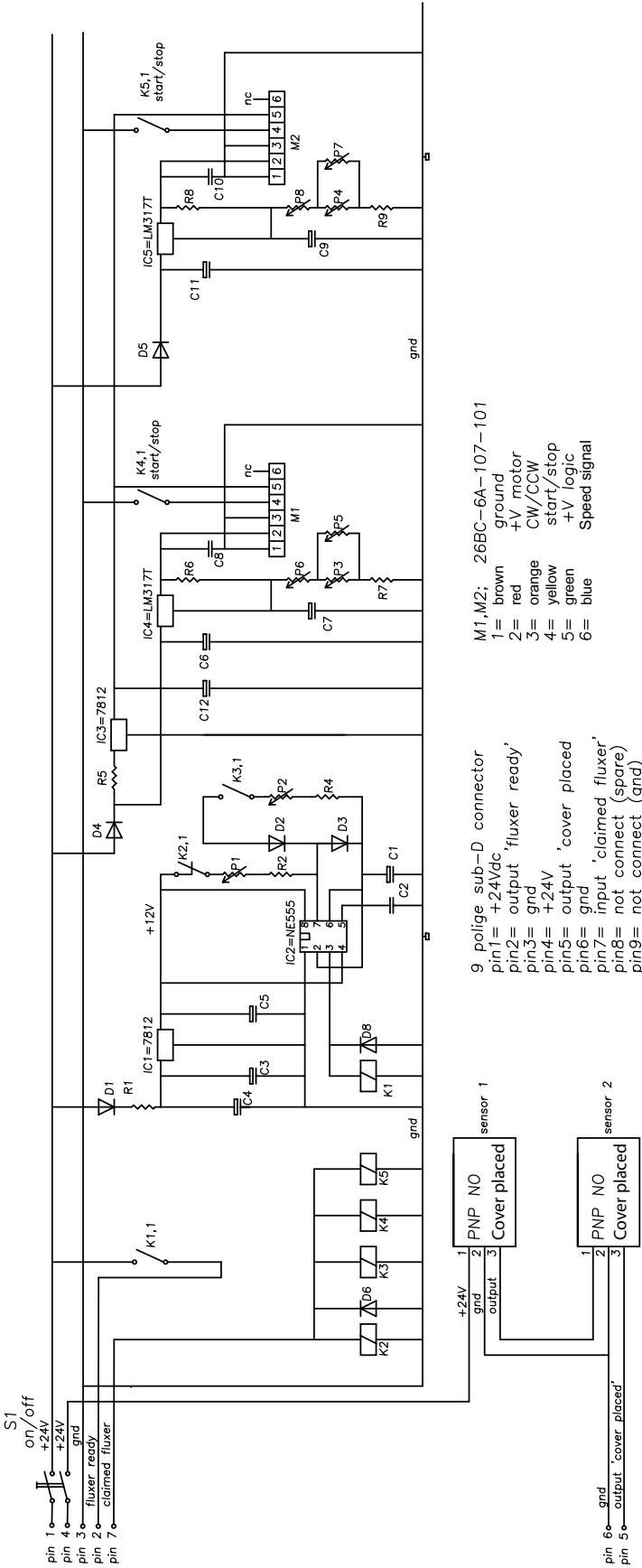


Figure 8 Fluxer diagrams

CHAPTER I6 Measurement, adjustment and calibration

I6.1 Specific parameters and settings

The disc speed of the fluxer is adjustable between 0-20rpm, default = 10rpm.

The speed can be adjusted by turning the potentiometer (11).

The layer thickness and the wiper adjustment are described in the user manual, chapter 11.4.

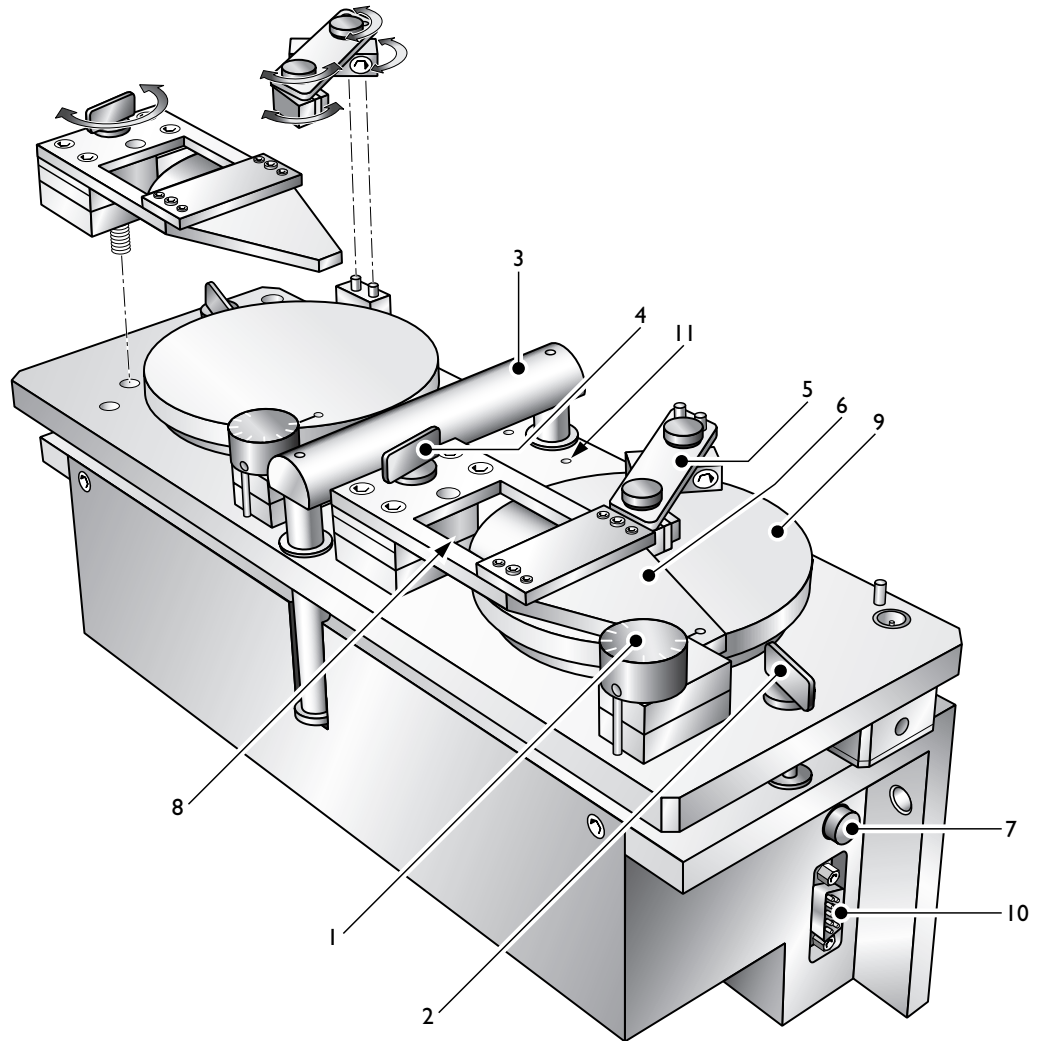


Figure 9 Flux unit

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CHAPTER I7 Maintenance instructions



NOTE: Operation, adjustment, maintenance and repair of this machine shall be carried out by **qualified and trained** personnel only.

This chapter contains detailed (corrective and preventive) maintenance instructions.

The preventive maintenance intervals are defined in [A7.3 Preventive maintenance schedule](#).

For Material Safety Data Sheets, see [A2.12 Material safety data sheets \(MSDS\)](#)

I7.0.0.1 Required Equipment

- Fibre-free tissue
- Cleaning agent (e.g. isopropanol, ethanol), depending on the kind of flux that is used.
- Brush for cleaning the measuring tool, e.g. a toothbrush
- Protective cover for the CA unit
- Gloves

WARNING: Cleaning agents are poisonous and highly inflammable. Observe the manufacturer's safety precautions when using cleaning agents.

Before starting maintenance work, put a protective cover over the CA unit.

I7.1 Fluxer, cleaning

While cleaning the flux unit your hands might come into contact with the flux. With some types of flux, it might be necessary to wear protective gloves. To see if this is the case, check the flux's material data sheet for hazardous material.



NOTE: Remove at least one trolley before accessing the work-area. This makes for easier access to the work area.

- Stop the system and stop the rotation of the disk with the On/Off button .
- Unplug the I/O connector.
- CAREFULLY remove the cover of the flux unit.
- Take off the whole flux unit by turning the mounting knobs anti-clock wise.
- Place the unit on a table.
- Remove the flux layer height adjustment squeegee unit by turning the mounting knob anti-clockwise. Wipe the flux off the unit with fibre-free tissue and the appropriate cleaning agent.
- Take off the flux layer width limiter and wipe the flux off with fibre-free tissue and cleaning agent.
- Wipe the flux off the disk with fibre-free tissue and cleaning agent.

- Clean all the joined faces on flux layer height adjustment squeegee unit and flux Unit before placing the flux layer height adjustment squeegee unit back.
- Clean all the joined faces on the flux unit interface plate and flux unit before placing the flux unit back.

I7.1.0.1 Cleaning the measuring tool

While cleaning the measurement tool your hands might come into contact with the flux. With some types of flux, it might be necessary to wear protective gloves. To see if this is the case, check the flux's material safety data sheet for hazardous material.

- After using the measuring tool, it must be cleaned so that it can be used again.
- Clean the tool with a piece of cloth and a brush (e.g. a toothbrush) and some cleaning agent.

CAREFUL: the tool has some sharp edges which are difficult to clean with a cloth. Use a (tooth)brush instead and mind your fingers.



NOTE: On one flux unit there are two flux layer height adjustment squeegees. The position of these squeegees is unique because of the unique hardware calibration. To prevent the squeegees from being switched, unique fitting pins are placed. Also, the squeegees should not be switched from one unit to another.

CHAPTER I8 Installation and replacement instructions

I8.1 Fluxer, replacement

1. Prerequisites

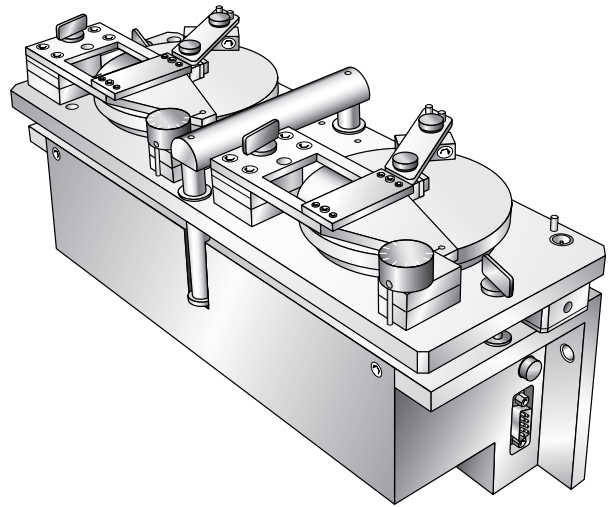
- Set the board transport to the smallest position

2. Remove fluxer

- Stop the machine and power down the fluxer with the On/Off button.
- Unplug the I/O connector.
- CAREFULLY remove the cover of the fluxer.
- Take off the fluxer by turning the mounting knobs anti-clock wise.

3. Installing the fluxer

- Installation in reverse order.



I8.1.1 Introduction

Only those parts of the fluxer that require special procedures will be detailed.

I8.1.2 Layout explanation

Description: The designation of the part (common with the Spare Parts List)

Item: Refers to the item number in the Spare Parts List.

Ordering Code: The ordering code as listed in the Spare Parts List.

Ergonomical aspects: States ergonomical aspects where applicable.

I8.1.3 Required equipment

- Standard tool set



DANGER, HIGH VOLTAGE PRESENT AFTER MAIN SWITCH OFF

Contact may cause electric shock or burn.

Turn off and lock factory fuses that supply power to the machine.



NOTE: When the system is switched off by means of the main switch, this main switch must always be locked by a padlock!



IRRITATING SUBSTANCE

Direct contact may cause irritation of the skin.

Avoid direct contact. Use Personal Protection Equipment.



NOTE: Isopropanol is poisonous and highly flammable. Observe the manufacturer's safety precautions when using isopropanol.



NOTE: Use correct shut-down procedures and switch off the factory power supply at the factory power switch before starting maintenance work.



NOTE: To avoid damage to the CA unit, put a protective cover over the glass plate before starting any maintenance work.

CAUTION

ESD SENSITIVE ELECTRONICS

Electro Static Discharge may cause damage to electronics.
Work in an ESD safe environment or use ESD preventive measures.



NOTE: To avoid component damage by ESD, take ESD protective measures before starting maintenance work on the system.



NOTE: To prevent poisoning wear gloves when handling the fluxer.

I8.1.3.1 Assy wiper fluxer

Description	Assy wiper fluxer
Item	20-1
Ordering code	see A8.4.15 Fluxer, spares
Ergonomical aspects	N.A.

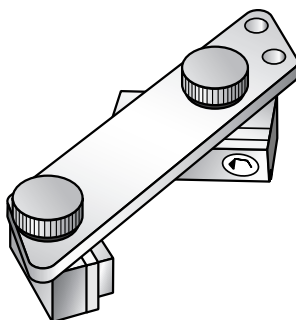


Figure 10 Assy wiper fluxer

- Check the teflon on wear.
- Wipers are adjustable.

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I8.1.3.2 Top module fluxer

Description	Top module fluxer
Item	20-2
Ordering code	see A8.4.15 Fluxer, spares
Ergonomical aspects	N.A.

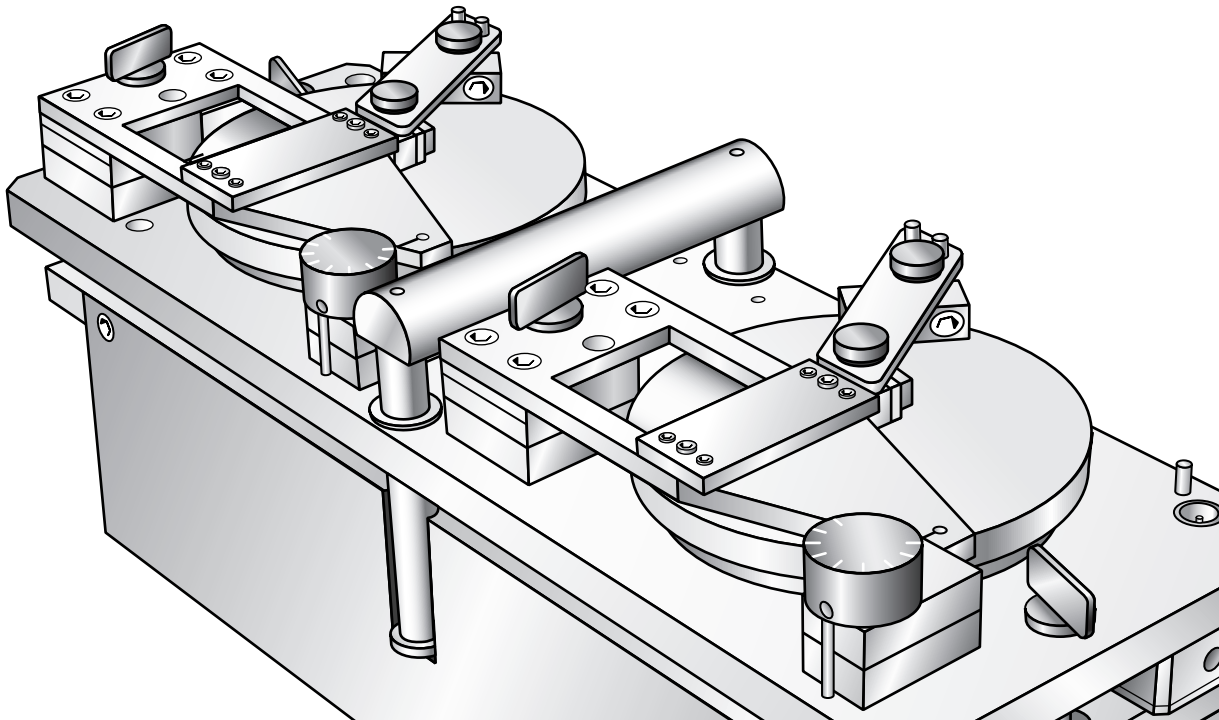


Figure 11 Top module fluxer

■ Dismantling

- Remove the old top module by loosening the quick release bolts.

■ Assembly

- Install the new top module by tightening the quick release bolts;
- Check squeegee position;
- Check layer thickness.

I8.1.3.3 EPD fluxer cover

Description	EPD fluxer cover
Item	20-5
Ordering code	see A8.4.15 Fluxer, spares
Ergonomical aspects	N.A.

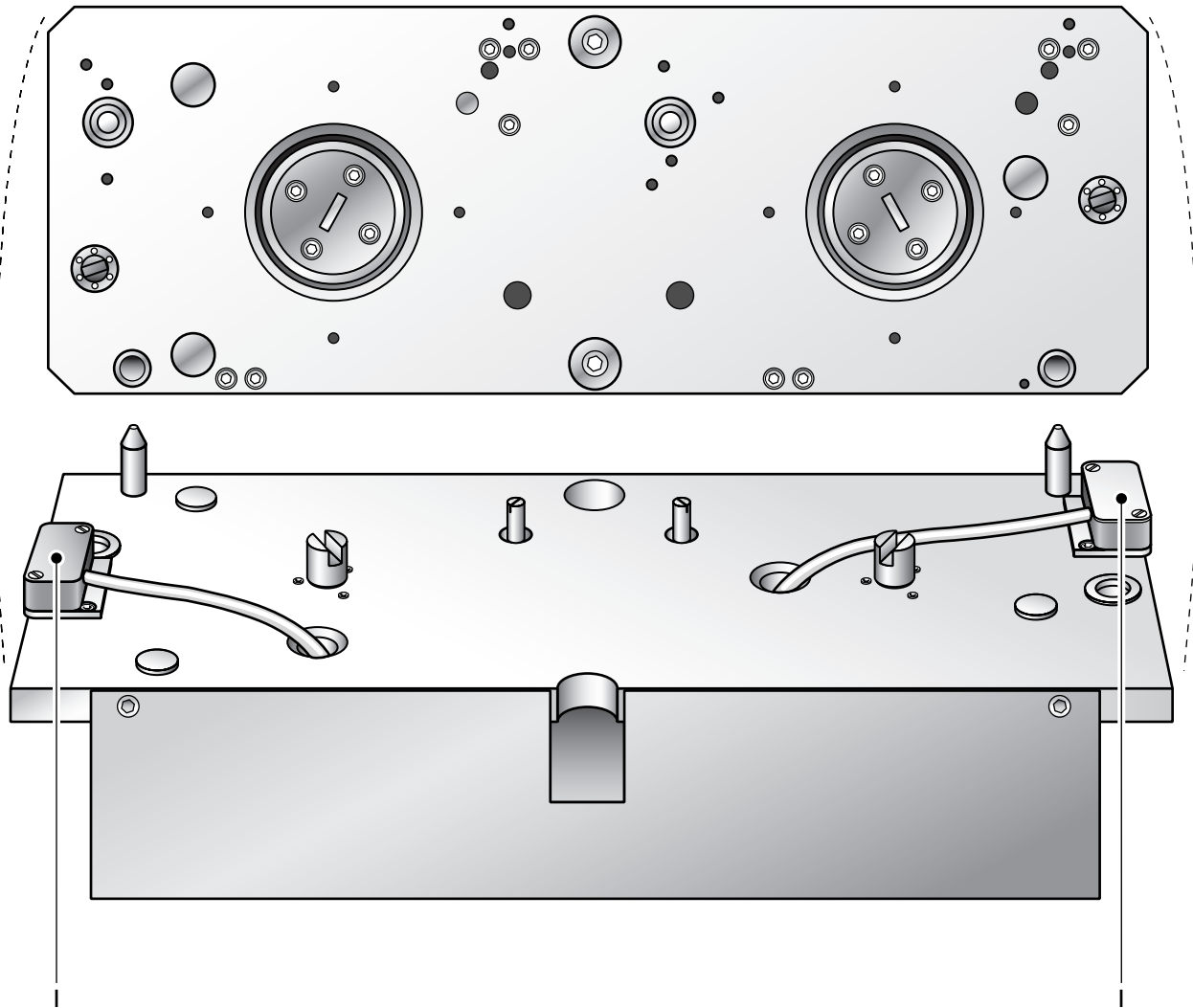


Figure 12 EPD Fluxer

■ Check the distance $d = 0.3\text{mm}$.

I8.1.4 Calibration

No calibration steps are required.

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Z. APPENDIX

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